COMPUTING FOR HOME AND BUSINESS

INTERFACE AGE™

DECEMBER 1980

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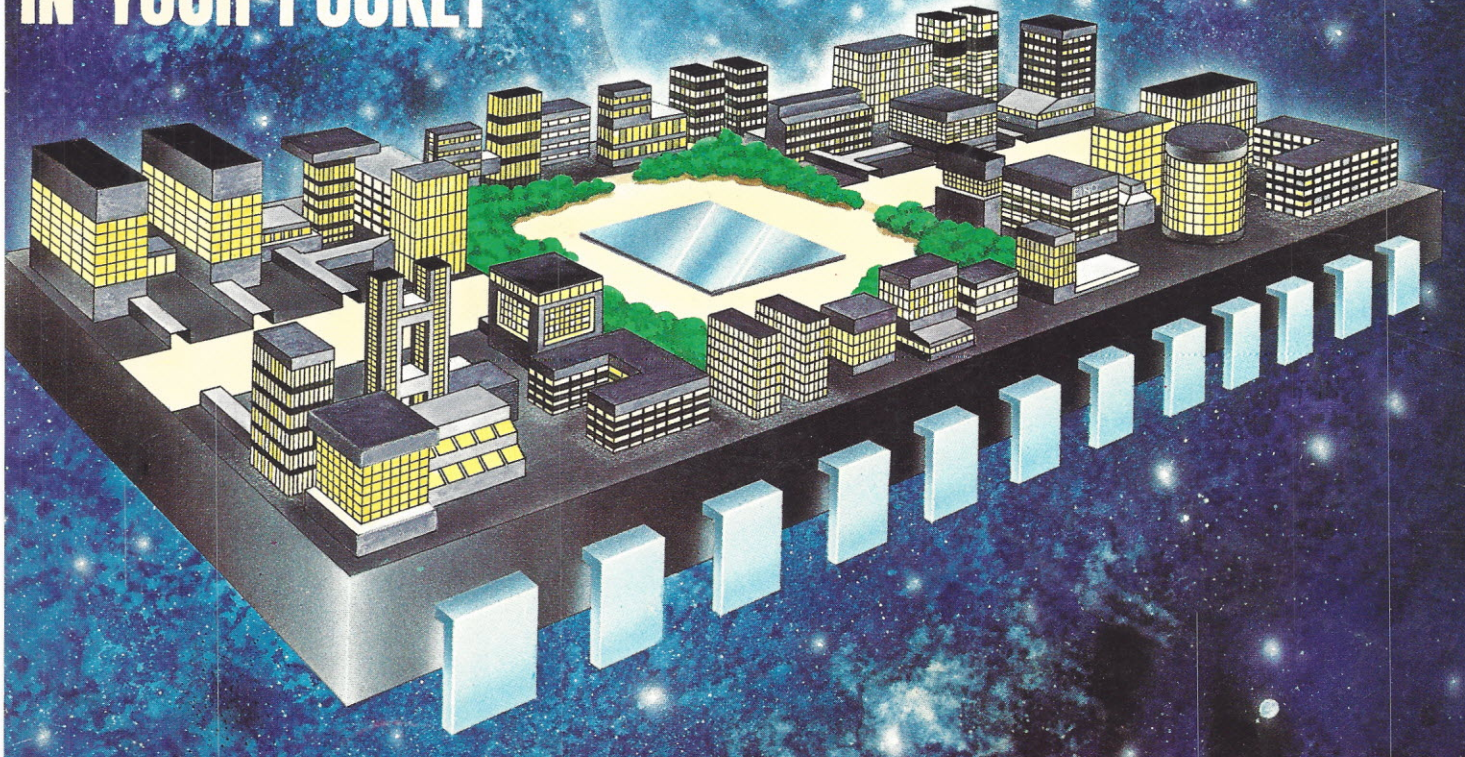

Move Over Electronic Mail... Here Comes Viewdata

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Illustrated by Fino Ortiz

Hard and Fast...

...Bulk Storage from Industrial Micro Systems

THE NEW MODEL 16

The new Industrial Micro Systems Model 16 Hard Disk Subsystem is a "fixed-removable" high speed, bulk storage device providing from 32 megabytes (32 million characters) to 96 megabytes of on-line storage for the Industrial Micro Systems 8000 or Series 5000 microcomputer systems. The Model 16 includes a credenza enclosure that provides a quiet, strong and attractive package for office or industrial applications where large memory is required. The Model 16 also includes a fully buffered DMA S-100 bus controller for fast and easy interfacing.

WINCHESTER TECHNOLOGY WITH BUILT-IN BACKUP

The Model 16 includes a 16 megabyte removable cartridge and a 16, 48, or 80 megabyte fixed media that employs Winchester 3340 technology. Files and programs may be copied between the fixed media and the removable cartridge for fast, easy backup and archival storage.

FAST ACCESS

The interface between the Model 16 hard disk and the Industrial Micro Systems computer is provided by the Hard Disk Controller. The Hard Disk Controller utilizes Direct Memory Access (DMA) for fast data transfer with minimum processor intervention. The maximum data transfer rate is 1.2 megabytes per second and the controller fully buffers the data, a sector at a time, to and from the disk. **Available in 220 V, 50 HZ Versions**

Now you don't have to look hard for fast computing power. Contact your Industrial Micro Systems Dealer today.

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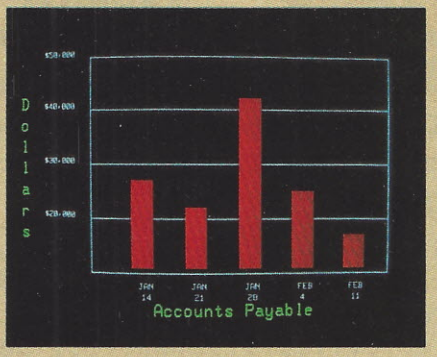
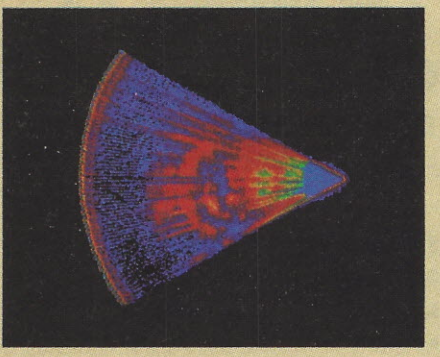


Management Information Display



Ultrasonic heart sector scan

High-resolution display with alphanumerics

Get the professional color display that has BASIC/FORTRAN simplicity

LOW-PRICED, TOO

Here's a color display that has everything: professional-level resolution, enormous color range, easy software, NTSC conformance, and low price.

Basically, this new Cromemco Model SDI* is a two-board interface that plugs into any Cromemco computer.

The SDI then maps computer display memory content onto a convenient color monitor to give high-quality, high-resolution displays (756 H x 482 V pixels).

When we say the SDI results in a high-quality professional display, we mean **you can't get higher resolution than this system offers in an** NTSC-conforming display.

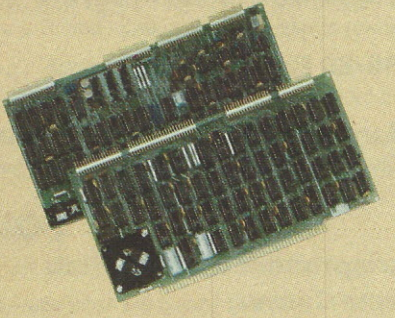
The resolution surpasses that of a color TV picture.

BASIC/FORTRAN programming

Besides its high resolution and low price, the new SDI lets you control with optional Cromemco software packages that use simple BASIC- and FORTRAN-like commands.

Pick any of 16 colors (from a 4096-color palette) with instructions like DEFCLR (c, R, G, B). Or obtain a circle of specified size, location, and color with XCIRC (x, y, r, c).

*U.S. Pat. No. 4121283



Model SDI High-Resolution Color Graphics Interface

HIGH RESOLUTION

The SDI's high resolution gives a professional-quality display that strictly meets NTSC requirements. You get 756 pixels on every visible line of the NTSC standard display of 482 image lines. Vertical line spacing is 1 pixel.

To achieve the high-quality display, a separate output signal is produced for each of the three component colors (red, green, blue). This yields a sharper image than is possible using an NTSC-composite video signal and color TV set. Full image quality is readily realized with our high-quality RGB Monitor or any conventional red/green/blue monitor common in TV work.

Model SDI plugs into Z-2H 11-megabyte hard disk computer or any Cromemco computer

DISPLAY MEMORY

Along with the SDI we also offer an optional fast and novel **two-port** memory that gives independent high-speed access to the computer memory. The two-port memory stores one full display, permitting fast computer operation even during display.

CONTACT YOUR REP NOW

The Model SDI has been used in scientific work, engineering, business, TV, color graphics, and other areas. It's a good example of how Cromemco keeps computers in the field up to date, since it turns any Cromemco computer into an up-to-date color display computer.

The SDI has still more features that you should be informed about. So contact your Cromemco representative now and see all that the SDI will do for you.

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SINCE DECEMBER 1975

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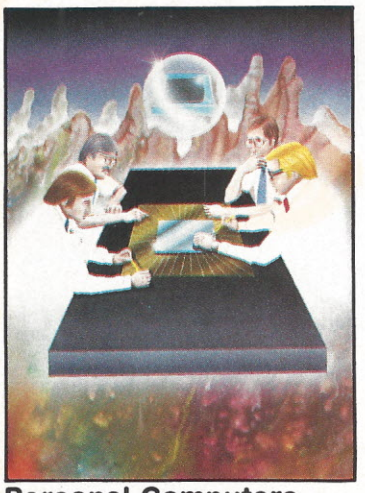

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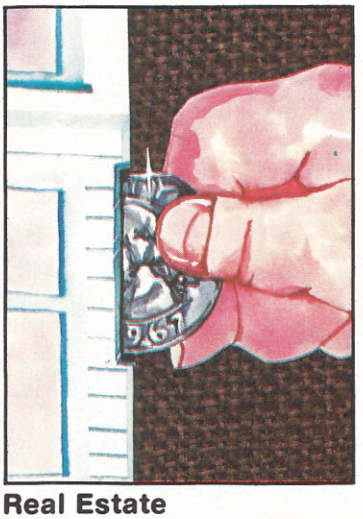

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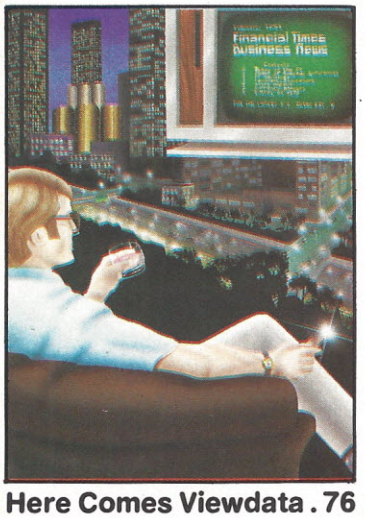

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Contact authors of monthly columns by writing to them at INTERFACE AGE, P.O. Box 1234, Cerritos, CA 90701 in care of their respective columns.

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Time & Money. Commodore®, Atari® & Apple® users get more with VisiCalc™ software.

A financial VP in Massachusetts is cutting the time it takes to prepare month-end reports from three days to three hours.

A California company is replacing most of its time-share computer service with a personal computer and VisiCalc, saving at least $30,000 the first year.

Thousands of other personal computer users are also sold on how VisiCalc is increasing their productivity. Besides saving time and money, they're simplifying their work and getting more information that helps them make better decisions. A typical user reaction comes from a New York dentist:

"VisiCalc has become an integral part of my business."

VisiCalc displays an "electronic worksheet" that automatically calculates nearly any number problem in finance, business management, marketing, sales, engineering and other areas. The huge worksheet is like a blank ledger sheet or matrix. You input problems by typing in titles, headings and your numbers. Where you need calculations, type in simple formulas (+,−,×,÷) or insert built-in functions such as net present value and averaging. As quickly as you type it in, VisiCalc calculates and displays the results.

"I am extremely impressed with VisiCalc's capability, flexibility and orderly presentation of instructions."

So writes the director of a New York corporation. He appreciates VisiCalc's powerful recalculation feature. Change any number in your model and instantly all numbers affected by that change are recalculated and new results are displayed. You can ask "What if . . .?," analyzing more alternatives and forecasting more outcomes. It really increases your decision-making batting average!

When you finish, you can print a copy of the worksheet just as it appears on the screen and/or save it on diskette.

"I like VisiCalc's ease of use."

That response comes from a Utah businessman using VisiCalc for production forecasts, financial report ratio analysis and job cost estimating. Ease of use is VisiCalc's best-liked feature. It's designed for a non-programmer, and has an extensive, easy-to-understand instruction manual.

Users also like solving a wide variety of problems with VisiCalc . . . and solving them their way. VisiCalc can even justify the cost of a personal computer, according to a New Hampshire financial analyst:

"VisiCalc is paying for itself over and over."

VisiCalc is available for 32k Commodore PET/CBM, Atari 800 and Apple disk systems. VisiCalc is written by Software Arts, Inc.

See VisiCalc at your Personal Software dealer. For your dealer's name, call Personal Software Inc. at 408-745-7841, or write 1330 Bordeaux Drive, Sunnyvale, CA 94086.

While there, see our other Productivity Series software: Desktop Plan and CCA Data Management System. They're like time on your hands and money in the bank.

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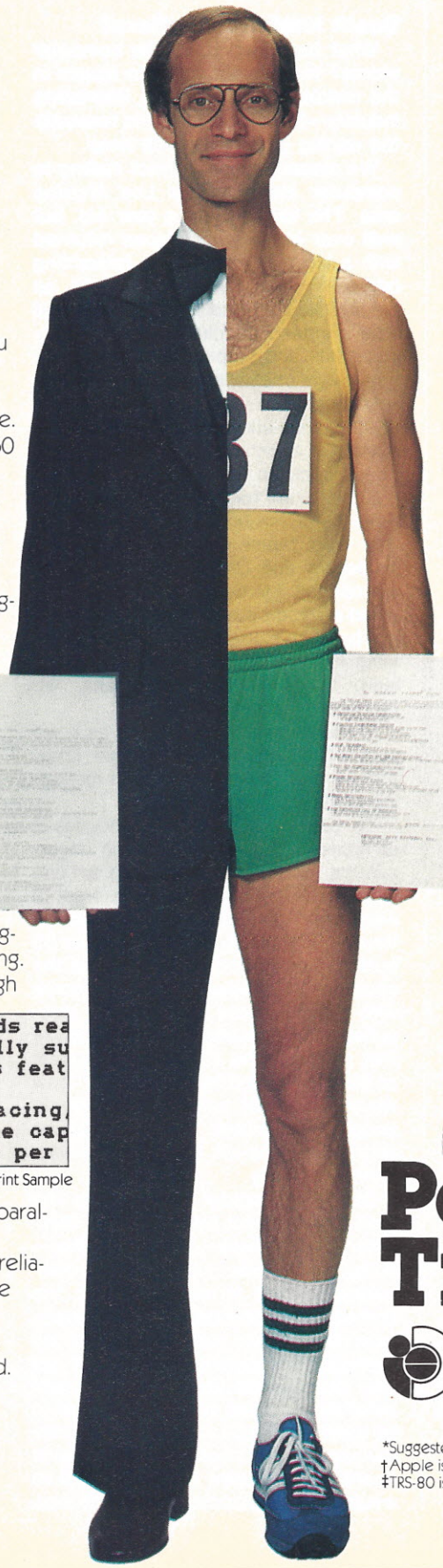

Until now, word processing output was a slow, expensive proposition. You could pay thousands for a slow, letter-quality character printer. Or give up print quality for matrix speed and price.

But that was before Paper Tiger™ 460 offered you a better choice.

The new Paper Tiger 460 is the first matrix printer with high-density dot matrix characters plus high speed. At a low price.

The secret? A unique nine-wire, staggered matrix head provides overlapping dots in both horizontal and vertical planes. The result is dense, high-quality characters you'll be proud to show off.

What's more, Paper Tiger 460 gives you a combination of features simply not available on any other printer, at any price. Like bi-directional, logic-seeking printing at speeds in excess of 150 characters per second. Microprocessor electronics, with built-in diagnostics and self-test. Proportional spacing. Automatic text justification. DotPlot™ high resolution graphics option. RS232 and parallel interfaces. And more.

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printer, the IDS 460, offers feat

Automatic proportional spacing,
processing systems, plus the cap
resolution of 84 by 84 dots per
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Paper Tiger 460 Print Sample

But its most important feature is high reliability. Paper Tiger 460 is designed to be tough and dependable. It has rugged, stepper-motor head and paper drives. A new rugged ballistic-type print head.

And its simple, chassis-mounted cartridge ribbon lasts up to four times longer than cassette or spool ribbons.

Paper Tiger 460 is the one printer that gives your Apple,† TRS-80,‡ or other small business computer both data processing and word processing output. At a price you can afford.

Get your paws on Paper Tiger 460, and join the tens of thousands of satisfied Integral Data Systems users. For the name of the Paper Tiger dealer nearest you, call us toll-free: 800-343-6412 (in Massachusetts, Alaska, and Hawaii: (617) 237-7610). Or, write for complete specifications. Integral Data Systems, 14 Tech Circle, Natick, Massachusetts 01760.

Paper Tiger 460

Integral Data Systems, Inc.

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EDITOR'S NOTEBOOK

Death Knell for Retailers?

What happened to all the computer stores? We thought we were square in the middle of a burgeoning, flourishing industry—but it's beginning to resemble the waning days of the hula hoop.

We recently made a direct mailing to computer stores in the Los Angeles area. The list was just a year old, but well over half our envelopes returned with a big red "moved: no forwarding address". We followed up with an automobile tour and found all the neat little shops once cluttered with computer kits and surplus teleprinters are gone—the ones with private, out-of-the way magazine racks and patient proprietors wise enough to know you were obviously months away from making a "buy" decision.

Some of our fondest memories are of Saturday afternoons pecking out the Star Wars theme on a borrowed 8080 processor and D-to-A converter while surrounded by busy foot traffic. You could eavesdrop on the sales pitches... maybe even snare a part-time programming job if conditions were right...and learn a lot. A new Americana, we thought. Were we wrong?

From the evidence, it looks as if we were. Computer stores, as we knew them, are on the way out. Other marketing paths are being trod.

To cite some: mail order houses—computers by mail, with all the uncertainties involved in purchasing a complicated, mysterious machine from a warehouse nine states away—are on the rise. IBM has quietly set up some 50 business computer centers around the country: one-product computer stores with plush carpets and smooth, gray-suited sales personnel. (We will analyze that product—the 5120—as a System of the Month next month.) Other "new wave" computer sales outlets include department stores, office machine distributors and—in Canada—the telephone company.

Did the computer stores drop the ball? You bet your byte they did. Computer stores have—and are today—doing a miserable job of selling computers to their strongest market: the first-time user. We get calls every week from readers who want a computer, are sitting on the purchase cash—but get very discouraged just entering a computer store. These people don't want to be sold; they don't want technical comparisons with machines they never heard of. They want to be educated on a subject their schools never mentioned.

The reason, of course, is talent. Either it is lacking or computer stores are unable to attract technically qualified people with the communication skills needed on the "front-line" with walk-in customers. Baiting computer salesmen used to be a favorite sport for our technical staff. Now it's too easy—the fun is gone from watching a sales type stumble out an answer to a tricky electronic question.

We begin to realize that selling computers is a tough job; one that requires far more than average talent. Good salesmen are rare, and usually underpaid.

The other major "people" problem we see is the computer store owner (perhaps a wizard with micros) who is way over his head when it comes to managing even a small business. We can sympathize with that problem, too, but it's our observation that more computer than shoe stores go broke every year.

Will the stores survive? We hope so. But think not. Other, better organized forces are marshalling to replace them. A few, or course, will keep going. The well financed, cannily managed, technically competent ones will be with us well into the future. If your town is gifted with one, it's worth your support and patronage.

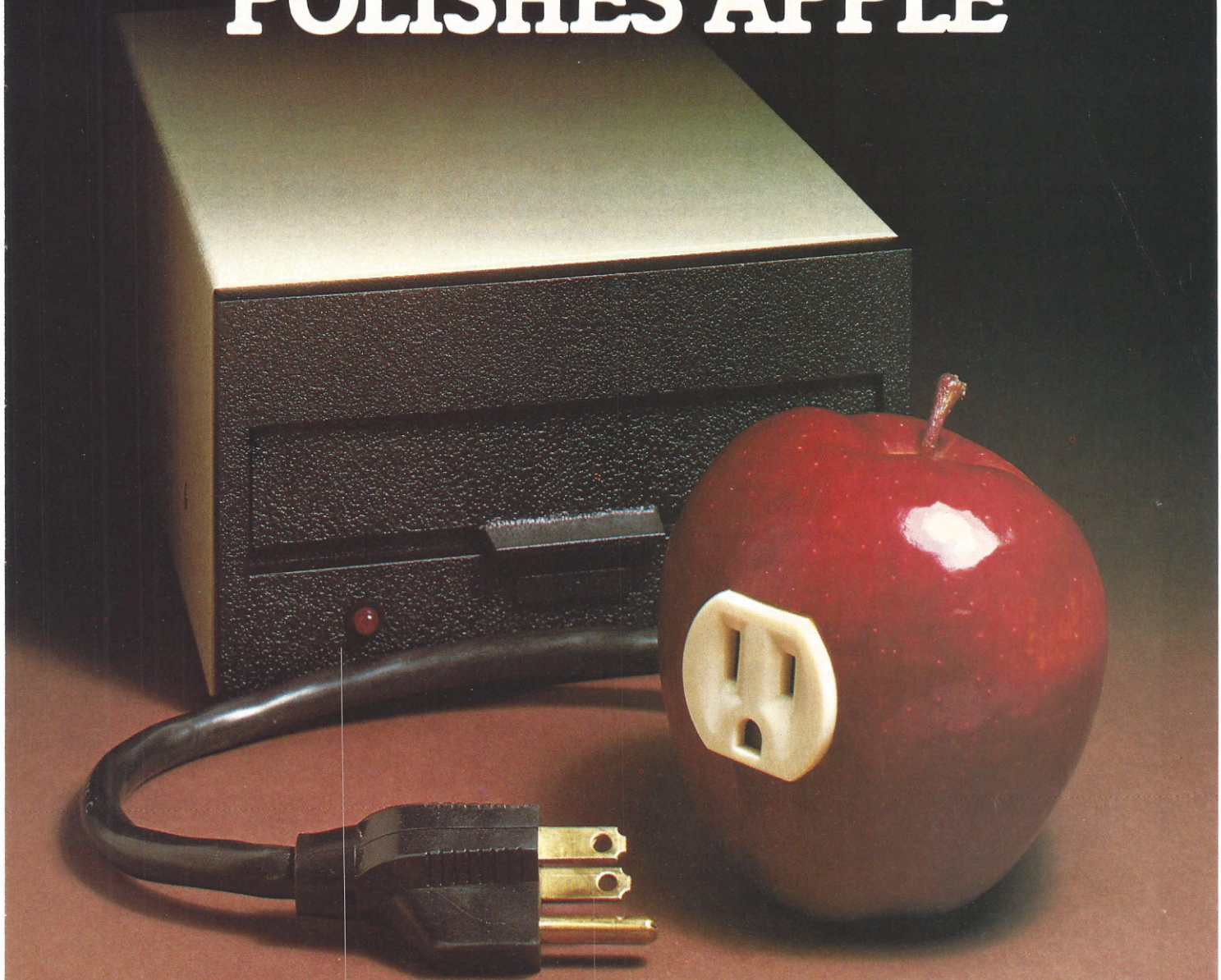
Computer stores can, of course, survive. There is no overpowering force responsible for their decimation—only an inability to perform their chosen task. But, in a back-hand way, that's good news too. If the problem is internal, it can be solved with internal effort. Let's get at it, retailers. The world needs you.

Polymorphic Systems changes its mind

In System of the Month (Oct 80), I reported that this firm would market the Datamaster II data base package and two versions of Pascal: the USCD to execute the P-code, and the Pascal/MT, a subset running under the normal operating system for the 88. Since then, Bob Martin, marketing VP, says the company is temporarily backing off and wants to rethink its plans and engage in some more market research before making any strong commitment. It might be a good idea. George Grinstein, chairman of the board, Computers & Peripherals Unlimited, Inc., says the products aren't Polymorphic's in the first place. He claims that it started out as a joint venture, and that Polymorphic tried to run with the ball all by itself. It's now in the hands of attorneys.

—TF

NEW DISK SYSTEM POLISHES APPLE™



Micro-Sci's new disk drive family really makes your Apple shine.

Both the A-40 and A-70 offer extra performance plus the ability to read existing diskettes written on Apple Disk II systems.

And a jumper selectable boot prom for 13 and 16 sector interger Basic or 8 sector Pascal comes standard.

The Model A-40 actually costs a lot less than Apple Disk II drives. Yet it provides 40 tracks instead of 35, along with up to 20K increase in capacity. Maybe an extra 20K isn't anything to write home about, but the speed sure is—5 ms track to track vs. Apple's 15 ms.

The Model A-70, on the other hand, features twice the tracks and capacity of the Apple Disk II, but it costs only a few dollars more.

The secret of outstanding performance and reliability is a state-of-the-art design incorporating a band positioner, instead of a plastic cam, plus an improved media centering system.

SPECIAL DISCOUNT.

One A-40 plus controller is priced at only $495 and the second drive is just $395. You can save up to $200 per system over Apple II drive prices.

And you can save even more if you act now. Contact us today for a special $50 introductory discount on your Micro-Sci A-40 or A-70 system order.

μ-SCI

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LETTERS

Down to business

Re your business software reviews, a one page review of a serious business application can hardly be more than a token effort. The biggest problem in the microcomputer field is the lack of good software on the market. There is a crying need for a reliable source of information for users. While your publication is certainly making a good effort in this area, I would like to make the following suggestions.

It doesn't help much to simply parrot the information in advertising literature. The journalist should interview several fairly sophisticated users of the product or, if none can be found, say so.

Investigate a few widely accepted minicomputer programs of the same type to get a general idea of the level of sophistication that the micro package should be aiming for. Print the comparisons.

Identify programs that your reviewers have looked at, but didn't consider good enough for a full-scale review. Potential users could save time by avoiding the simplistic and totally inadequate systems on the market.

Dale Varco
South Beach, OR

Birds of a feather

We are a small poultry processing company operating in the Morobe Province of Papua, New Guinea. Our operations include rearing and breeder farms, hatchery, contract growers and processing plant. Our plant presently handles 25,000 birds per week but we should be processing 70,000 per week by 1984.

We are interested in the computerization of all production and financial systems, with integration of the two as much as possible. We are making inquiries of computer hardware and software companies, independent computer specialists, computer users in Papua, and poultry producers in other countries. As Papua is a less developed country, the necessary expertise here is nil. We would be grateful for any information your readers can send us.

C.M. Smith
Niugini Tabe Birds Pty. Ltd.
P.O. Box 1152, Lae
Papua, New Guinea

Interstellar News—latest edition

The Headlining Interstellar News program (IA Sep 80) is indeed fun.

Below are changes to make it useful to those with TRS-80 mod I level II who don't have printers.

Add line 0003 RANDOM

Change line 0070 to read
PRINT:PRINT

Add line 0105 FOR K = 1 to 1000: NEXT K

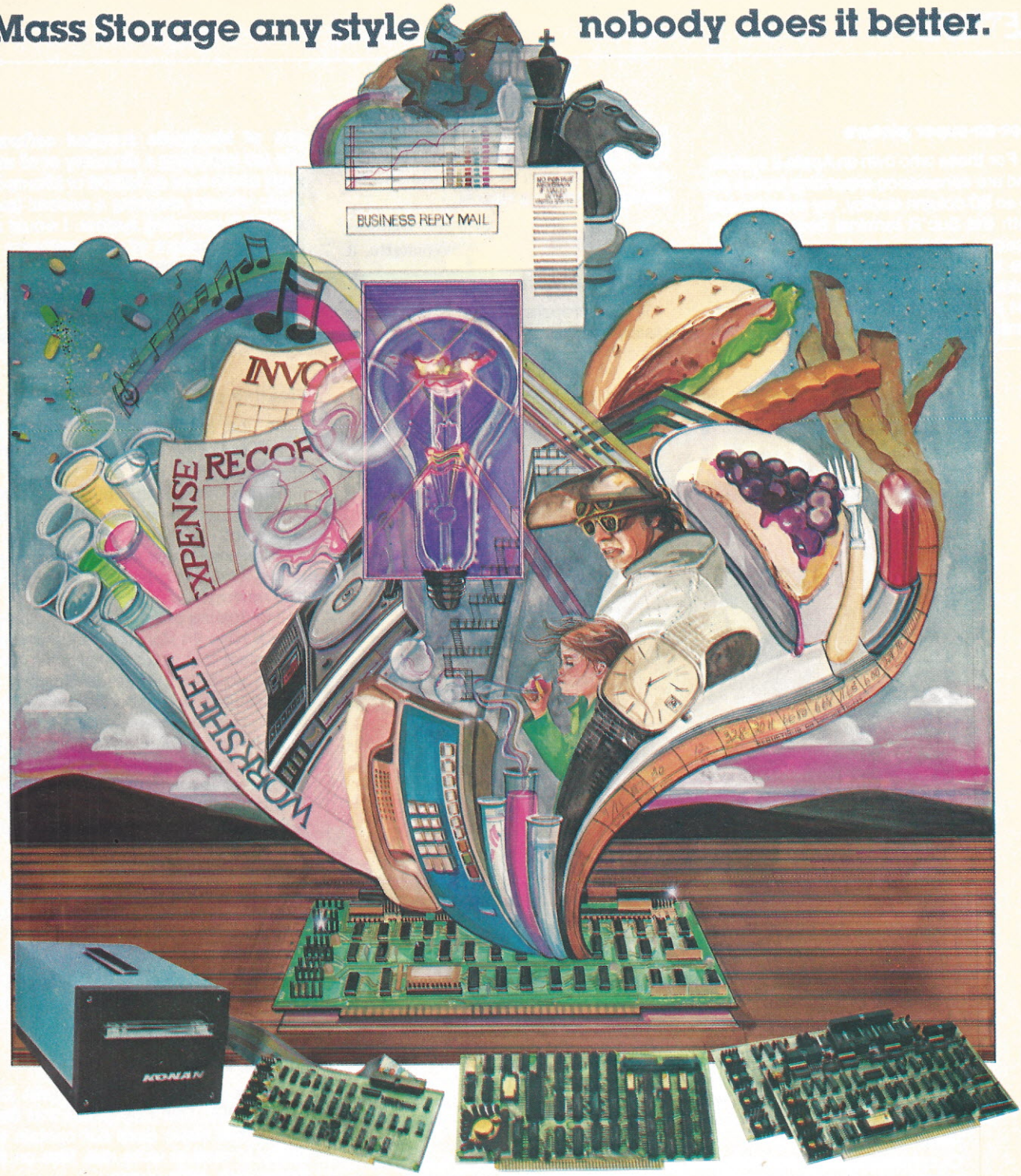
This is a timer loop which allows time to scan output on screen. Some people will have to use K = 1 to 1300.

Change line 0500 to read
0500 LET N1 = RND(N):
V1 = RND(V)
: A1 = RND(A) : RETURN

It would probably be best, when booting up the level II, to type in 'clear 1000' before starting the program.

Otto B. Van Horn
Albuquerque, NM

Mass Storage any style nobody does it better.



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Take your pick to suit your needs. There's the SMC-100™ storage module (SMD or CDC 9760 interface) hard disk controller...the HARDTAPE™ subsystem which offers tape and/or hard disk Winchester backup....Konan's new KNX-500™ software compatible with Alpha-Micro's AM-500*...Konan's new SDC-100 error correcting intelligent disk controller for the Shugart Technology 5 1/4" ST506 hard disk and Shugart Associates 8" SA1000...and more to come!

Better can't be found. For exciting, but dependable hard disk and tape controller boards (and superlative I/O boards) for your S-100 computer, contact the company that's IN CONTROL.

Call Konan's direct toll-free information line: **800-528-4563.**

Or write: Department B, Konan Corporation, 1448 N. 27th Avenue, Phoenix, Arizona 85009. TWX/TELEX 910951l552.

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Not-so-super picture

For those who own an Apple II system and are considering expanding from a 40 to an 80 column display, my experiences with the Sup'R terminal board and the Leedex monitor can be useful. While the monitor performs well with the 40 column Apple II, I found it impossible to get a clear picture using the Sup'R terminal board. Repeated efforts at adjustment on both monitor and the board failed to produce a legible display. The only solution was to substitute another monitor, namely a Hitachi.

Sunil Subbakrishna
Wilmette, IL

Call for software

The Micropolis Users Group is an association which wants to maximize the use of Micropolis supplied software. We are compiling a directory of all software which runs on MDOS or Micropolis Basic without requiring a second (such as CP/M) operating system. I would appreciate suppliers of such software informing me of their products.

Buzz Rudow
604 Springwood Circle
Huntsville, AL 35803

Floating point issues

Re the letter from S. Redfern (IA July 80), I would like to expand on a couple of points.

Strictly speaking, built-in floating point is not necessary since it can always be simulated with integers. A good example of a software implementation for floating point is Brent's Fortran package.

The floating point variables in Apple II Pascal have 24 significant bits, which is equivalent to 7 to 8 decimal digits. Even in this precision, most calculations on physical data are uncertain (more from the inherent errors in the data than from the effects of roundoff). But there are other calculations where judicious use of greater precision is the fastest way to put roundoff out of sight and out of mind. Full quadruple precision, however, is hardly ever useful.

Finally, an IEEE committee is at work on standardizing binary floating point for microprocessors. Interested persons may write to me for details.

David Hough
Box 561
Cupertino, CA 95015

At your command

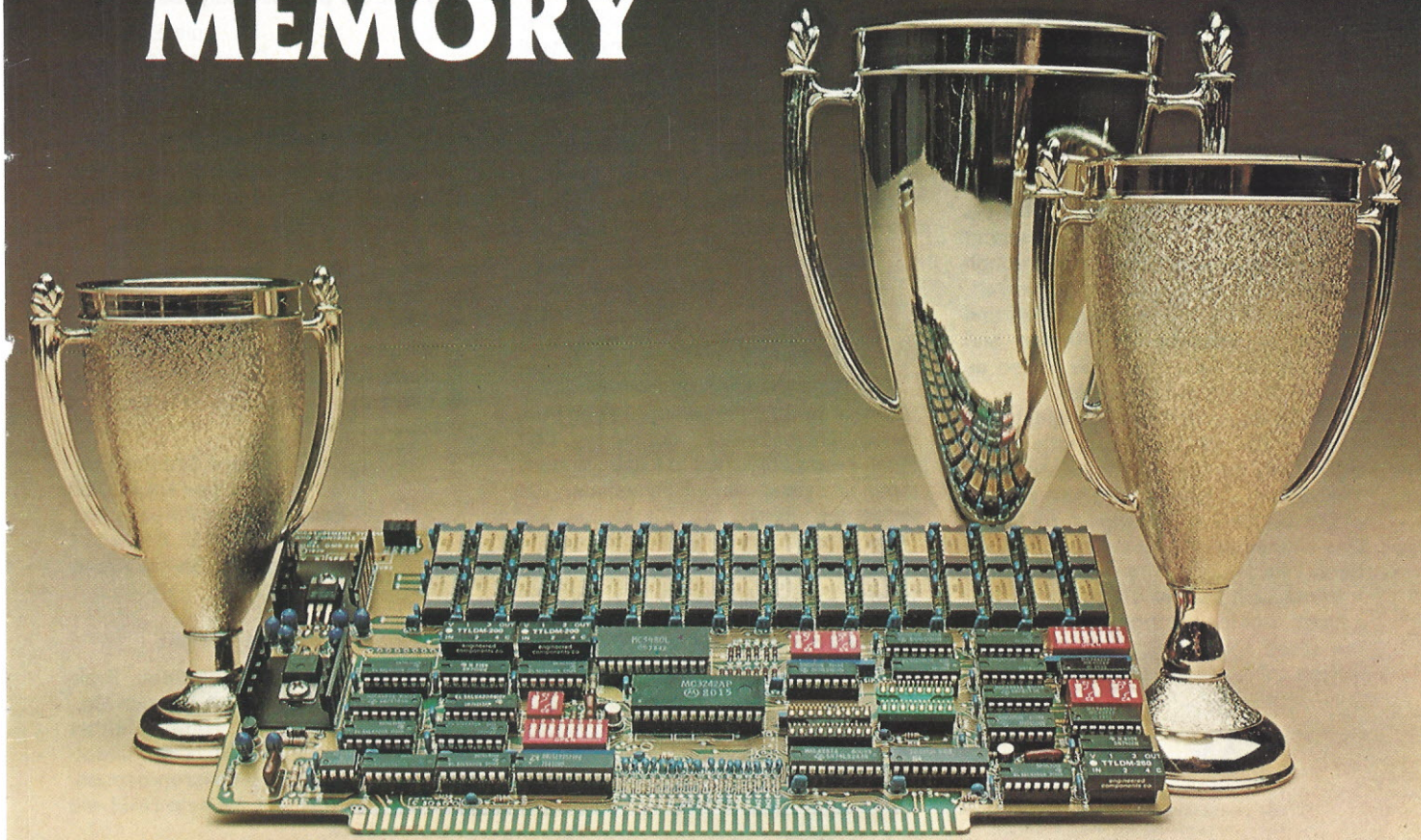
Re the article on WH89/Zenith Z89 (IA Aug 80), Tom Fox states that Benton Harbor Basic does not contain the ability to read or write disk files on the floppy disk. He's wrong.

There are commands for writing and reading sequential files. They are: 'OPEN''FILENAME.EXT''FOR WRITE AS FILE#n' and 'OPEN''FILE NAME. EXT''FOR READ AS FILE#n', where .EXT is the extension that identifies the type of file, i.e., .BAS or .DAT (for Basic or data) and 'n' is a number from one to five. Five files can be opened at one time.

To write to a file, the command is:
PRINT#n,A;B$;C.
To read the file, it is:
INPUT#n,A:LINE INPUT#n,B$, etc.

Jennifer T. McGraw
Miami, FL

THE UNBEATABLE S-100 MEMORY



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Flight program turbulence

Not having a Heath H19 video terminal, I am unable to run Thomas Carbone's B-747 flight simulator program (IA Aug 80). However, the listing shows a few technical errors that readers may want to correct in the interest of added realism.

All occurrences of the word "flap" should be changed to "pitch." Pitch is controlled by the fore and aft movement of the control column (not stick) through the elevators on the tail of the aircraft. Flaps are used only during takeoff and landing to increase lift. Raising and lowering the flaps could be added as another feature of the simulation.

Runways are marked according to the nearest 10° of their magnetic alignment. Only the first two digits are used. Therefore, a runway aligned at 45° would be called "runway zero four." One aligned at 316° would be "runway three two."

Windshield heat is left on throughout a flight...not for defogging but to soften the glass for protection against bird strikes. (The window will flex instead of shattering.) On the B-747, windshield wipers are used for rain and fog removal.

Incidentally, a project is currently under way to replace the conventional instruments in the B-747 with a computer generated video graphics display. Imagine a hobbyist struggling to program a satisfactory cockpit simulation on his micro, while a pilot might be trying to figure out how to get his instrument display computer to play Star Trek.

Joe Maguire
Int'l. Air Service Co.
Burlingame, CA

The flight simulation is the best entertainment program I ever have seen published. Nevertheless, during my first flight, I was astonished to leave Kennedy radar scan and almost immediately be entering Bradley.

To remedy this, I have modified the logic and figures as follows:

```
2470 IF T>41.40 AND N<73.25 THEN 2090
2480 GOTO 720
2490 IF T>41.50 AND N<73.05 THEN 2140
2450 GOTO 720
```

The coordinates could be wrong, but they suit the program purposes better.

Luis E. Suarez
Caracas, Venezuela

Saudi users search for news

We are a group of Apple II owners in Saudi Arabia. Most of us have two disks with Pascal. As you might well imagine, we find it difficult to obtain current information on what is happening with microcomputers in general in the US, and the Apple in particular. We are interested in corresponding with any and all clubs and individuals that can keep us current. We are also interested in swapping disks.

C. Bradon Gresham, Jr.
Red Sea Apple Club
Saudi Arabian Parsons Ltd.
P.O. Box 3694
Jeddah, Saudia Arabia

Cartridge programs sought

I recently acquired a Video Brain home computer built by A Umtech Co., model number 101A, made in either Santa Clara or Sunnyvale, CA. I understand it has an F-8 8-bit microprocessor built by Fairchild with 1K byte RAM and 4K byte ROM.

I am looking for cartridge programs with a 45-terminal bus, expander sets, or anything that would be interchangeable. Any information or leads would be appreciated.

Richard L. Rowland
7072 Kenwood
Las Vegas, NV 89117

Don't forget construction

I was pleased to note in a recent editorial that special articles for the small businessman are to be featured. However, the construction industry is too often ignored. Being relatively labor intensive, construction probably employs more people than any other industry. Let's see some articles on the computer in construction, especially for the small firm.

Fred Pearce
St. Anns, Trinidad

Correction

Pascal M is the registered trademark of Sorcim Corp, Santa Ana, CA, and not a product of Digital Marketing as reported in Sep 80.

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Tom Knight, President—
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CIRCLE INQUIRY NO. 90

Electronic yellow pages to revolutionize advertising

What one industry source terms "the worst news for the newspaper industry since the advent of radio 60 years ago" is about to batter the classified ad market, currently running about $4.6 billion. It's the electronic yellow pages, soon to be offered by AT&T according to a report in Videoprint newsletter. This, coupled with related electronic advertising, is expected to slice 25% or more off the newspaper classified market.

Total annual revenue from yellow page advertising is in the $2 billion range, making AT&T the world's largest publisher. (People do not usually associate the telephone company with publishing, making AT&T an almost secret participant in the publishing industry.)

AT&T is reportedly actively experimenting with electronic directories. It recently ran a "concept trial" in the Albany, NY area to test reactions from both residential and business participants to the idea of telephone directory information using a video terminal with a telephone set, visual display screen and a typewriter-like keyboard.

Users could reach over 500,000 Bell System and independent telephone company directory listings within the 10,000 square miles encompassed by the 518 area code, as well as 180,000 yellow page listings for Manhattan. Also included were weather reports, sports, horoscopes and comments by psychologist Dr. Joyce Brothers, along with police, fire and hospital emergency numbers.

AT&T is said to be extremely secretive about the results but publicly has indicated that overall reaction to the electronic information system was very positive.

Upstart word processing firm hurls market challenge at IBM

Compucorp, a Los Angeles-based manufacturer of word and data processing systems, is challenging word processing customers to rent an Omega word/data processing system while awaiting delivery of their IBM Displaywriter.

The basis for the contest is IBM's promise of "...early 1981" delivery vs. off-the-shelf delivery of the Compucorp system.

While waiting for the IBM delivery, and after working with the competing system, if a customer decides that it offers more than the IBM product, the rental can be renewed, or the customer can purchase the Compucorp system. However, if the customer still feels that the IBM product will better meet his needs, rental on the Omega need not be renewed.

The theory is that in just getting someone to try its system, Compucorp will gain a customer...while IBM loses one.

Software library set up for personal computer users

A full lending library by mail for software and books for users of TRS-80 and Apple computers has been established by the Home Computer Library, Madison, OH. The service will start with hundreds of cassettes from leading software authors, as well as books on general computer subjects. The library plans to add "shelves" for disk software and for a variety of software for other computers including Texas Instruments, Atari and PET.

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Up to date patient information available anytime. Patient files are updated everytime a transaction is entered. All you need to check their files is to enter the patient's name – no ID number.

PRIVATE AND THIRD PARTY BILLING

System keeps track of third party billing and insurance claims. You can bill the patient on paper while they are in the office! Resubmission of a claim is as simple as pushing a button.

TECHNICAL SPECIFICATIONS

Written in Pascal, the system runs on most any 56K or 64K micro or mini computer. The system is currently operating on Dynabyte, Cromemco, Onyx, Vector Graphic, and Digital Equipment Corporation (DEC) computers. Different systems provide 500 to 10,000+ patient capacity.

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CIRCLE INQUIRY NO. 54

Annual membership will be $20 and new members will have a 30-day money back guarantee. After joining, members can borrow software and books for a 3-week period for a charge of $1 to $5. Emphasis will be on educational, small business and home application software, as well as utilities and games. This will give members a chance to use many programs they would not normally buy.

Study reveals bubble memories are here to stay

Those who have been waiting to see whether bubble memories are going to join plated wire and planar thin film technologies in the memory graveyard can be reassured by a study issued by Venture Development Corp. A recent report notes that, although unexpected problems in producing this new technology have wreaked havoc with intended price cuts and have stunted industry growth, there is a silver lining. The bubble memories in the field are performing beautifully in commercial applications. Technical problems have been confined to production; once shipped, the bubbles continue to work. Many would-be users are only waiting for prices to decline. The report predicts that this time spokesmen for leading producers of bubbles will be right about price reductions.

Bubble memory shipments are expected to increase from $18.4 million in 1980 to $226 million in 1985, an average yearly increase of 65%. First major applications were in areas such as numerical control of machine tools (where dust and chemicals in the atmosphere make moving magnetic media unsuitable), and in portable terminals where resistance to shock is important. As prices decrease with larger volumes and more experience in producing bubble domain memories, use will shift from specialized areas such as adverse environments to more general memory applications.

Call for papers issued on law and information policy

With the 1980s shaping up as the decade in which governments throughout the world codify the laws under which the information industry will live for the next century, the *Computer/Law Journal* is publishing a 2-volume set entitled *Law and Information Policy* scheduled for release in early 1981.

Papers are being sought on the legal aspects of fact-gathering, information storage, retrieval and transmission. Topics of interest include privacy, protection of data bases, Viewdata and similar systems, transborder data flow, access to government data bases, cryptography, and the antitrust aspects of the telecommunications industry. Articles addressing the international aspects of information law and policy will be of particular interest.

Authors interested in submitting papers should write Dr. Jon Bing, Norwegian Research Center for Computers and Law, Oslo University, Karl Johans Gt. 37, Oslo 1, Norway, or Michael Scott, Editor-in-Chief, Computer/Law Journal, 530 West Sixth St., Los Angeles, CA 90014.

Jurisprudent Computerist

By Elliott MacLennan
Attorney at Law

Tax-Free Computer Purchase and Lease

X corporation is in the business of buying, selling and leasing used computers and equipment. During the course of their work, the four principals owning X corporation become aware from time to time of equipment that is available for purchase and lease. On one such occasion, X corporation did not have sufficient working capital to invest in certain equipment even though its purchase and subsequent lease to third parties appeared to be quite profitable. To obtain the funds required for the purchase, X corporation took the following steps:

X corporation had in effect a pension and profit sharing plan. The participants were, respectively, the four principals and two secretaries. Believing that the rate of return yielded by leasing equipment to third parties would be substantially in excess of that earned on other investments coming from the pension and profit sharing plan trusts, they sought to have the trusts purchase the computer equipment.

Before describing the computer purchase and lease transaction, a brief description of the Employee Retirement and Income Security Act rules and requirements is in order. Without parallel exception, ERISA has created the greatest tax shelter possible under American tax law.

ERISA, also known to lawyers and others who have to work with it's complex requirements as "every ridiculous idea since Adam," permits a corporation maintaining a pension and profit sharing plan (when used together) to deduct up to a maximum of 25% for contributions made on behalf of employees. For simplicity, a brief example may serve to mathematically illustrate ERISA's principals.

Assume a corporation has only one employee-owner. After paying all operating expenses, but before paying the owner's salary, $100,000 remains in the corporate coffers. If the corporation pays owner $100,000, owner pays tax on $100,000. Assuming owner has no other deductions and is in the 50% tax bracket, owner pays $50,000 in tax.

However, if owner has corporation establish a pension and profit sharing plan, the tax rates change substantially. Owner has corporation contribute $25,000 to the plan trusts; $75,000 remains to be distributed as salary. Assuming the same 50% tax bracket for the owner, the tax drops to $37,500. The corporation obtains a deduction for the $25,000 plan contribution.

ERISA has created the greatest tax shelter possible...

Two important considerations are noteworthy. If owner wishes to borrow 75% of the $25,000 in the trusts to purchase, say, a house, owner may do so provided he repays the borrowed funds with adequate interest, and provides compensative security. This can be and usually is accomplished by recording a second mortgage or second deed of trust with the local county recorder's office. The interest paid by the owner to the trusts is tax free—and tax deductible—further reducing owner's $37,500 burden.

So owner substantially decreased his tax payable, made a deductible contribution to a pension and profit sharing plan, and bought a house...all with tax-free working capital...and a tax deduction to boot.

Returning to X corporation, the four principals had their trusts buy the computer equipment, which they leased to third parties. The act of leasing the computer equipment in this situation has one drawback. Leasing of plan-owned assets (computer equipment) constitutes unrelated business income, which is taxable. Notable, however, is that the four principals sought permission of the Internal Revenue Service which, along with the Department of Labor, regulates plan investments.

The four principals could probably have carried out the transaction without paying the unrelated business tax by borrowing money from the plan trust, purchasing the equipment, and leasing it to third parties themselves. In the situation described, the Internal Revenue Service permitted X corporation's plan trusts to use 100% of its funds to purchase computer equipment. The four principals could not borrow more than 75% of the trust's funds without breaking ERISA regulations.

To the extent that it is possible to extract a generalization from the transaction under discussion, perhaps the bottom-line cost to a computer purchaser or lessee is inextricably connected to the tax framework of the transaction. The American businessman has never been known to cringe at structuring business transactions. Tax planning fits hand-in-glove with our tradition of providing a customer with the most for the least. □

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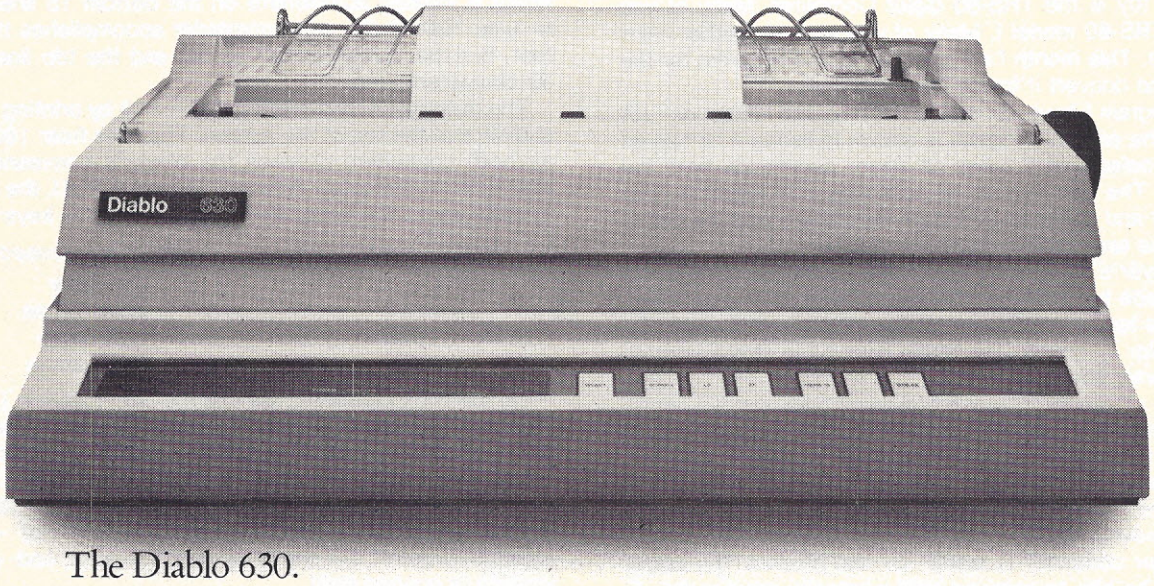

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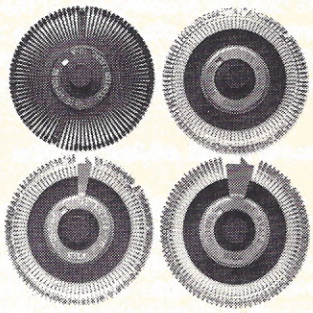

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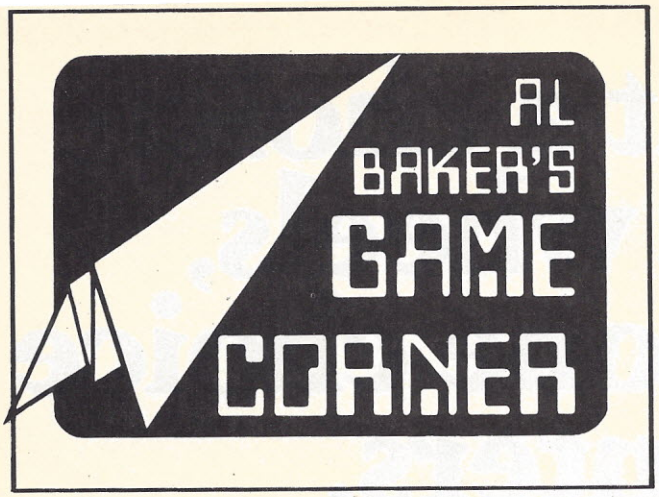

"Mining the Asteroids"—Now In Color

Few things thrill me more than playing with a new computer. My latest toy is the TRS-80 Color Computer. Many of you own the TRS-80 model I. Many of you also own other color computers. This month I am going to take a program for the model I and convert it to the color computer.

The program I have chosen is "Mining the Asteroids" (IA Jul 80). The original program is shown in listing 1. It has no sound or color, and it takes all player commands from the keyboard. The new version of Asteroids is in listing 2. This uses color and sound to add dramatic impact, and the player controls his spaceship from the joysticks.

The player's goal is to mine nine asteroids spread out across space before time runs out or his fuel is exhausted. Across the top of the screen are the player's vital statistics. On the color computer, the labels have been abbreviated to fit the shorter line length.

T, S, and F are the player's remaining time, current score, and remaining fuel reserves. U and V are the player's horizontal and vertical velocities. If U is positive, the player is moving right. If negative, the player is moving left. Likewise, if V is positive the player is moving down and if V is negative the player is moving up.

The color computer is faster. On the model I, the player crashes if he hits an asteroid with a velocity greater than 5. Given the higher accelerations possible on the color computer, the player can mine asteroids safely at velocities up to 10.

The nine asteroids are represented by the digits 1 to 9 spread out over the lower portion of the screen. The player's spaceship is the red blinking dot in the center. The spaceship is moved by firing its engines. On the TRS-80 model I, this was done by pressing one of the four arrow keys. On the color computer, the player uses the right joystick. On either computer, the player slows his spaceship by firing the engines in the direction opposite to his motion.

Sound lends added realism

Sound has been added to the game on the color computer. A continuous two-beep signal tells the player the current horizontal and vertical velocities of the spaceship. As it accelerates in either direction, the appropriate beep begins to get high in pitch. If the pitch gets too high, a crash is possible. The player quickly learns exactly how high a pitch is safe.

The game is initialized beginning at line 500 on the model I or line 540 on the color computer. X and Y are the horizontal and vertical positions of the spacecraft on the screen times ten. The color computer's screen is half as wide and two-thirds as high as the screen on the model I. This gives X the value of 320 instead of 640 and Y the value of 160 instead of 240.

Both programs set the initial velocities, time, and fuel allocations in lines 590 to 640. Line 610 is used to clear the screen. Here is our first significant difference between the two machines. The color computer gives you a choice of colors when clearing the screen. CLS by itself would clear the screen to light green—the text background color. CLS 0 clears the screen to black, the correct background for plotting colored shapes.

Both lines 500 and 700 are missing from the color computer listing. It does not support integer variables. Fortunately, its speed is great enough to make them unnecessary. Neither does it support the 'random' statement. There is no easy way to mess up the order that the random numbers will choose to place the asteroids on the screen.

Slight difference in screen size

Lines 710 to 790 are almost identical on both computers. These lines place the asteroids on the screen in random locations and jump up to line 110 to play the game. The only difference is line 720. The color computer screen is 16 lines of 32 characters instead of 16 lines of 64 characters as on the model I. Line 720 on the model I picks out a screen location which is located somewhere on the bottom 15 lines of the tv. Line 720 on the color computer accomplishes the same feat, but the screen is half as big and the top line is only 32-characters long.

The main game loop begins at line 110 by printing the vital statistics at the top of the screen. The lines from 160 to 200 on both computers process the player's commands. How they do it is completely different. On the model I, the program directly peeks the keyboard to read the arrow keys:

If PEEK(14400) = 1	Then key pressed is:
8	Up arrow
16	Down arrow
32	Left arrow
64	Right arrow

On the color computer, we use the right joystick. Line 160 picks up its horizontal value. If the joystick is all the way to the left, this value is 0. If it is all the way to the right, this value is 63. It varies from zero to 63 depending on where it is between its leftmost and rightmost positions. Line 160 takes the number between 0 and 63 and converts it into −1 if the joystick is far left, 0 if the joystick is centered, and +1 if the joystick is pushed right.

Line 170 performs the same trick with the right joystick's vertical position. The further forward the joystick is pushed, the smaller the value of 'joystk(1)'. Variable B is set to −1 if the joystick is pushed forward, 0 if the joystick is centered and +1 if the joystick is pulled back.

Lines 180 and 185 take the joystick horizontal direction and adds it to the spaceship's horizontal velocity. If the absolute value of U isn't too great, the new velocity is converted into a beep. The 'sound' statement will produce a high pitched tone the higher the absolute value of U. The value of 1 on the 'sound' statement is the sound's length. Here the beep will be very short. Lines 190 and 195 perform the same magic on the vertical velocity of the spacecraft.

Lines 230 to 270 remove the spaceship from the screen and compute its new position. Lines 250 and 270 handle the problem of screen wrap-a-round. If the spaceship moves off the screen in any direction, these lines put it back on the opposite edge. Here again, the change in screen size is reflected in these statements.

Line 330 determines if the spaceship has hit an asteroid. On the model I, the program peeked the tv screen to see if a number was there. On the color computer, the program can 'point' to a new location and determine if something is there. The result of using the 'point' function is the color number, zero if black, or −1 if text is present. If the program finds text, it goes to line 440 to test for a successful mining operation or a crash. Otherwise, it puts the spaceship back on the screen and checks to see if the game is over. If not, it continues the game loop. Notice the new third parameter on the

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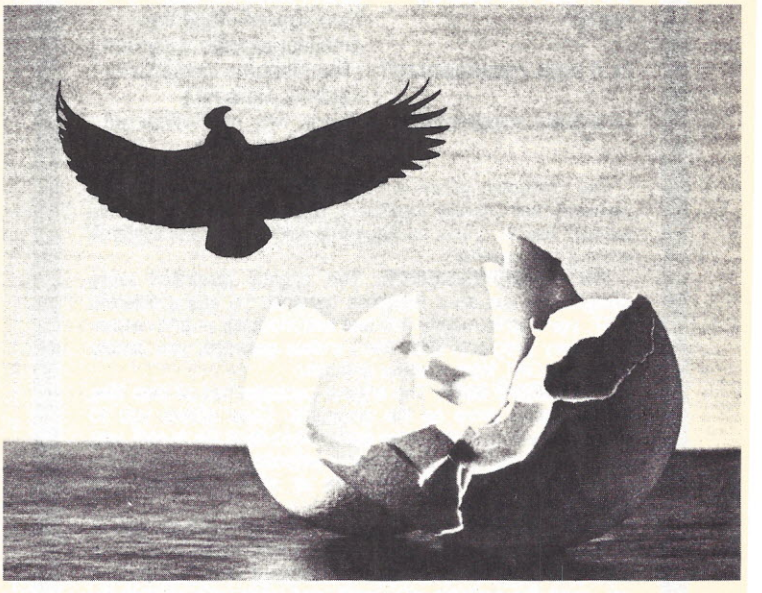

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'set' statement. This is the color of the point being turned on. I chose the number 4, or red.

Finally, lines 440 to 460 process a mining operation or crash. If the speed of the spacecraft is greater than five on the model I or ten on the color computer, we have a crash. If not, the asteroid has been successfully mined. On the model I, determining the value was easy. We have already looked at the Ascii value of the asteroid in line 330. Line 450 converts this value into a number and adds it to the player's score.

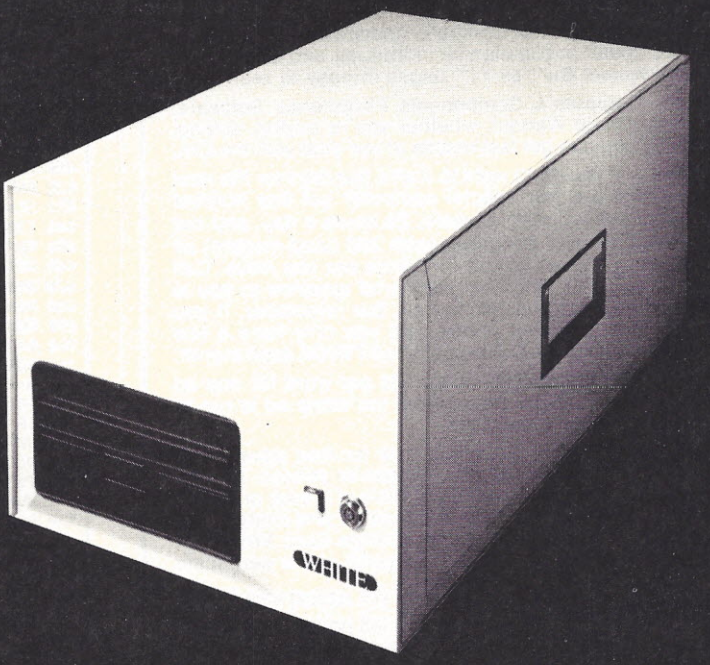
The program for the color computer doesn't have this Ascii value available. Line 450 converts the spaceship's X and Y position into a screen location. Then lines 452 through 456 compare this position to the table of positions created when the game was started. The score is the number of the N array element that matches this position. Since we have sound available, the program also signals a successful mining operation with an additional longer tone. The pitch of the tone is based on the value of the asteroid mined, a higher tone for a richer strike.

One final change was made to the program. If the player crashes, he is presented with a Bronx cheer. This is handled on line 880.

This is the first time I have converted a game from one computer to another in this column. If you found this valuable or entertaining, let me know. If there are games I have done for one computer that you would like to see on another, tell me. If I can't do it here, I may be able to help you do it through correspondence. □

Listing 1: The original TRS-80 program from July 1980 Game Corner.

```
10 REM ... MINING THE ASTEROIDS ...
20 REM
30 REM
40 REM
50 REM GO INITIALIZE STUFF
60 REM
70 GOTO 500
80 REM
90 REM HERE IS THE MAIN GAME LOOP- FIRST GIVE THE PRINT-OUT
100 REM
110 PRINT@0,"TIME=";TI;"   SCORE=";SC;"   FUEL=";FU;"
    U=";U;"   V=";V;"   ";
120 REM
130 REM SCAN THE KEYBOARD FOR ARROW KEYS.
140 REM UPDATE FUEL AND VELOCITY
150 REM
160 IF PEEK(14400)=8 THEN V=V-1 :FU=FU-1
170 IF PEEK(14400)=16 THEN V=V+1 :FU=FU-1
180 IF PEEK(14400)=32 THEN U=U-1 :FU=FU-1
190 IF PEEK(14400)=64 THEN U=U+1 :FU=FU-1
200 REM
210 REM MOVE SHIP AND UPDATE COORDINATES
220 REM
230 RESET(X/10,Y/10)
240 X=X+U
250 IF (X>1270)+(X<0) THEN X=1270-X+U
260 Y=Y+V
270 IF (Y>470)+(Y<30) THEN Y=500-Y+V
280 REM
290 REM UPDATE TIME AND SEE IF THERE IS A HIT
300 REM IF NOT, FINISH MOVE, HANDLE END CONDITIONS, AND LOOP
310 REM
320 TI=TI-1
330 A=PEEK(15360+INT(Y/30)*64+INT(X/20))
340 IF (A<>32)*(A<>128) THEN 440
350 SET(X/10,Y/10)
360 IF TI<0 THEN 830
370 IF FU<0 THEN 840
380 IF SC=45 THEN 850
390 GOTO 110
400 REM
410 REM HIT SOMETHING.  IF TOO FAST, TOO BAD
420 REM IF SLOW ENOUGH, ADD TO SCORE
430 REM
440 IF (ABS(U)>5)+(ABS(V)>5) THEN 870
450 SC=SC+A-48
460 GOTO 350
```



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WHITE

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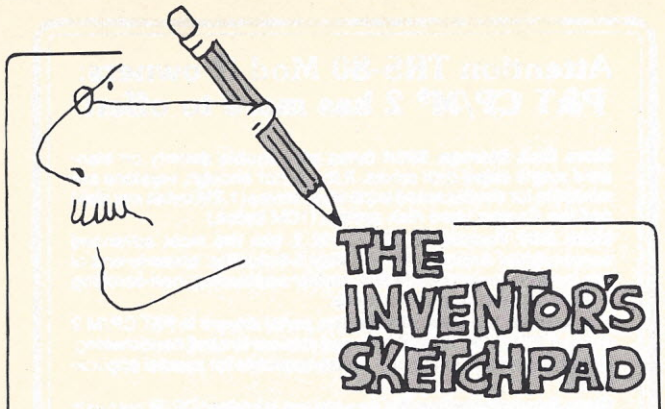
```
470 REM
480 REM INITIALIZATION
490 REM
500 DEFINT A-Z
510 REM
520 REM X AND Y ARE CURRENT SHIP LOCATION TIMES 10
530 REM
540 X=640
550 Y=240
560 REM
570 REM U AND V ARE THE X AND Y SHIP VELOCITIES, RESPECTIVELY.
580 REM
590 U=0
600 V=0
610 CLS
620 FUEL=500
630 SC=0
640 TIME=500
650 REM
660 REM PLACE THE 9 RANDOM DIGITS ON THE SCREEN
670 REM THE N ARRAY IS USED TO PREVENT PLACING ONE DIGIT
680 REM     ON TOP OF ANOTHER
690 REM
700 RANDOM
710 FOR I=1 TO 9
720 A=RND(959)+64
730 FOR J=1 TO 9
740 IF N(J)=A THEN 720
750 NEXT J
760 N(I)=A
770 PRINT@A,RIGHT$(STR$(I),1);
780 NEXT I
790 GOTO 110
800 REM
810 REM ENDING MESAGES
820 REM
830 PRINT:PRINT"TIME'S UP":END
840 PRINT:PRINT"OUT OF GAS":END
850 PRINT:PRINT"CONGRATULATIONS! YOU GOT ALL THE ASTEROIDS."
860 END
870 PRINT:PRINT"C R A S H ! ! !   WHO'S NEXT?":END
```

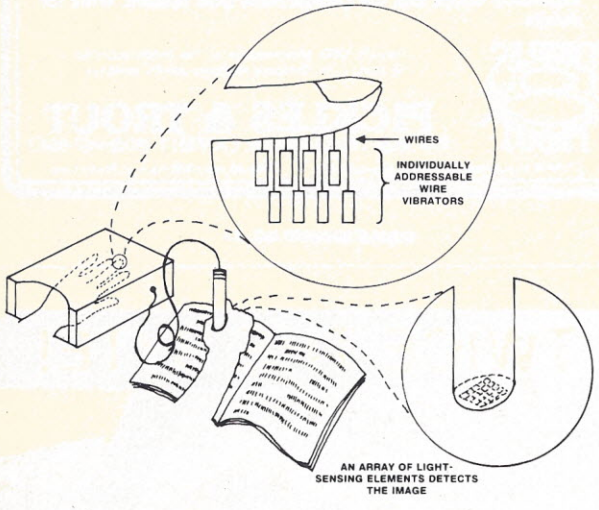
Listing 2: The TRS-80/color program adds color and sound and joysticks.

```
 10 REM ASTEROID MINING IN COLOR
 20 REM
 30 REM
 40 REM
 50 REM GO INITIALIZE
 60 REM
 70 GOTO 540
 80 REM
 90 REM MAIN GAME LOOP: PRINT DATA
100 REM
110 PRINT @0,"T=";TI;"S=";SC;"F=";FU;"U=";U;"V=";V;"  ";
120 REM
130 REM READ JOYSTICKS
140 REM UPDATE FUEL AND VELOCITY
150 REM
160 A=INT(JOYSTK(0)/21)-1
170 B=INT(JOYSTK(1)/21)-1
180 U=U+A:FU=FU-ABS(A)
185 IF ABS(U)<50 THEN SOUND 200+ABS(U),1
190 V=V+B:FU=FU-ABS(B)
195 IF ABS(V)<50 THEN SOUND 200+ABS(V),1
200 REM
210 REM MOVE SHIP/UPDATE (X,Y)
220 REM
230 RESET(X/10,Y/10)
240 X=X+U
250 IF (X>630)+(X<0) THEN X=630-X+U
260 Y=Y+V
270 IF (Y>310)+(Y<20) THEN Y=330-Y+V
280 REM
290 REM UPDATE TIME/SEE IF HIT
300 REM IF NOT, MOVE AND LOOP
310 REM
320 TI=TI-1
330 A=POINT(X/10,Y/10)
340 IF A<0 THEN 440
350 SET(X/10,Y/10,4)
360 IF TI<0 THEN 830
370 IF FU<0 THEN 840
380 IF SC=45 THEN 850
390 GOTO 110
400 REM
410 REM HIT: IF TOO FAST-CRASH
420 REM IF SLOW, UPDATE SCORE
430 REM
440 IF ABS(U)>10 OR ABS(V)>10 THEN 870
450 A=INT(X/20)+INT(Y/20)*32
452 FOR I=1 TO 9
454 IF N(I)=A THEN SC=SC+I:SOUND 50+I*10,5
456 NEXT I
460 GOTO 350
470 REM
480 REM INITIALIZATION
520 REM (X,Y)= SHIP LOCATION
530 REM
540 X=320
550 Y=160
560 REM
570 REM U=XSPEED, V=YSPEED
580 REM
590 U=0
600 V=0
610 CLS 0
620 FU=500
630 SC=0
640 TI=500
650 REM
660 REM PLACE 9 DIGITS ON SCREEN
670 REM NARRAY KEEPS DIGITS FROM
680 REM LANDING ON EACH OTHER
690 REM
710 FOR I=1 TO 9
720 A=RND(479)+32
730 FOR J=1 TO 9
740 IF N(J)=A THEN 720
750 NEXT J
760 N(I)=A
770 PRINT @A,RIGHT$(STR$(I),1);
780 NEXT I
790 GOTO 110
800 REM
810 REM ENDING MESSAGES
820 REM
830 PRINT:PRINT"TIME'S UP":END
840 PRINT:PRINT"OUT OF GAS":END
850 PRINT:PRINT"CONGRATULATIONS":PRINT"YOU GOT THEM ALL"
860 END
870 PRINT:PRINT"C R A S H ! ! !":PRINT"WHO'S NEXT?"
880 SOUND 1,20:END
```



by Roger C. Garrett

Touch-vision for the Blind

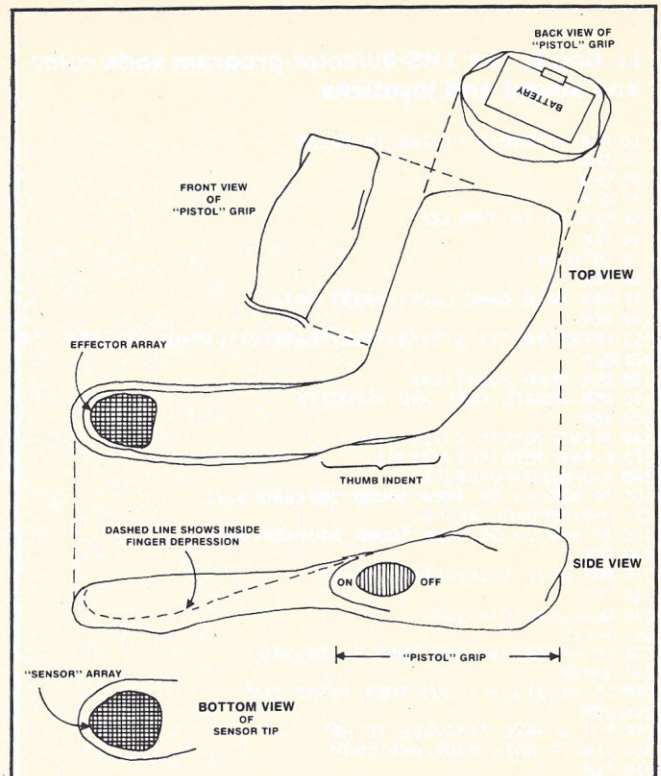


The hand-held, self-contained touch-vision wand.

About ten years ago I learned of a device that made it possible for the blind to read printed (non-braille) text. It consisted of a light-sensor array built into a wand, and a set of individually-controlled vibrating wires mounted as an array of points inside a box that also contained the driving circuitry. The wand was scanned across the printed page with the right hand.

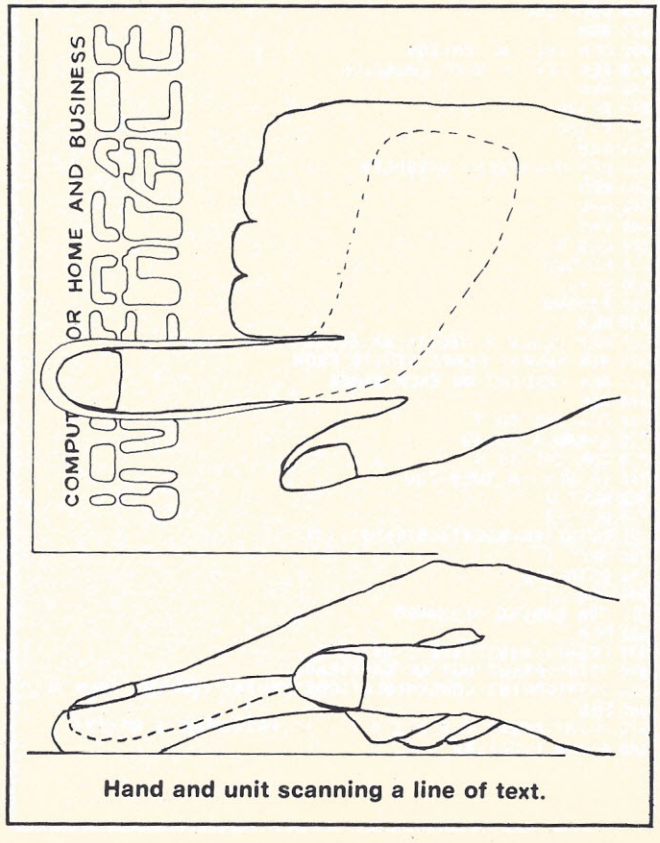
Each element of the light-sensor array was electronically connected to one of the vibrating wires, and the intensity of the vibration was directly proportional to the intensity of the light falling on the sensing element. With the user's left-hand fingertips resting on the vibrating wires, he could "feel" the shape of the characters and thereby read the text scanned by the wand.

While the basic idea is quite good, and it does work, there are some drawbacks, not the least of which is that it requires both hands to operate and is quite bulky to carry around. It would seem reasonable that some of today's technology could be combined to create a smaller, less obtrusive device that could perform the same function. I offer here my concept of a hand-held self-contained touch-vision wand...



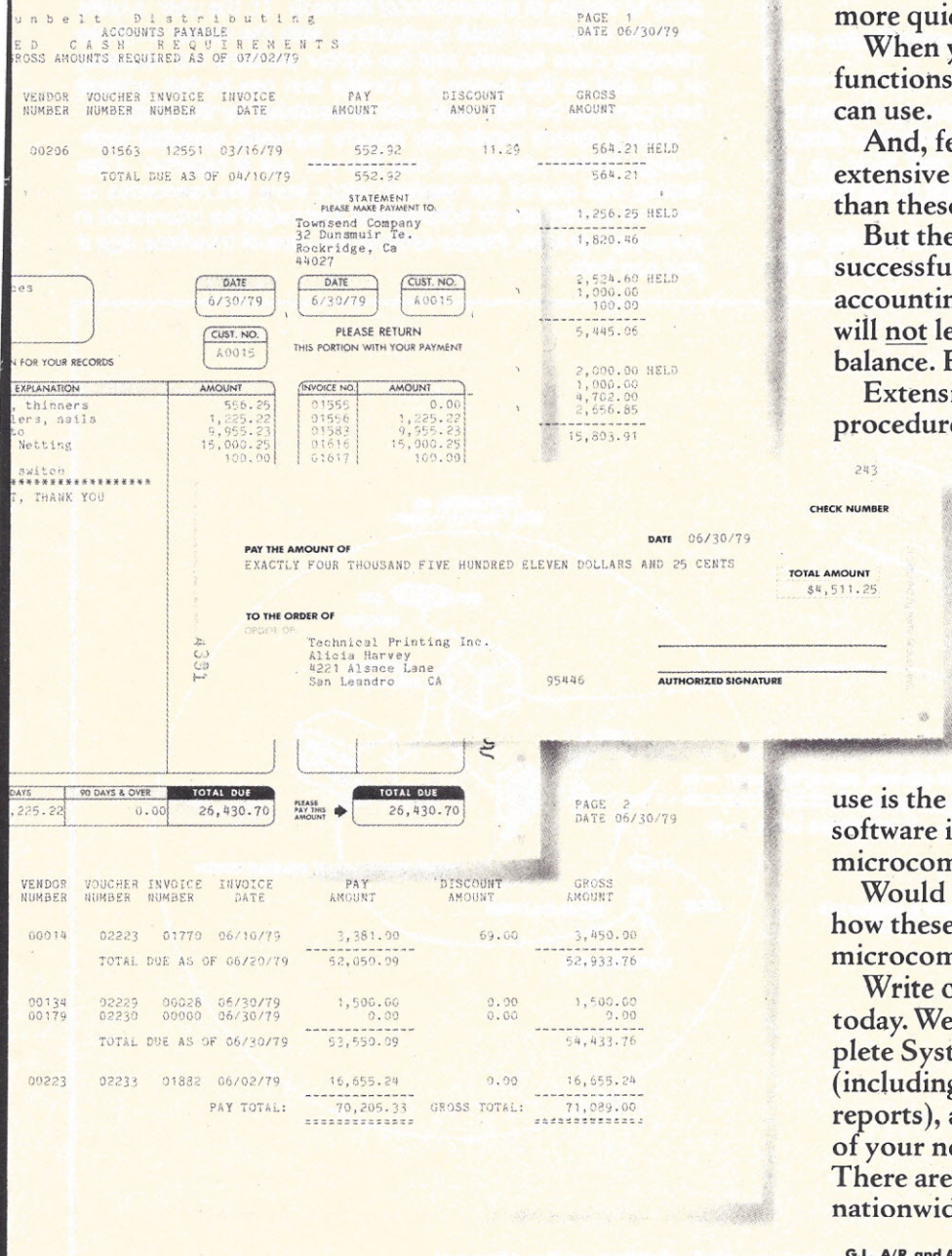
The pistol-grip unit fits in the palm of the hand.

The entire unit is shaped to fit in one hand. The unit shown is designed for the right hand but it obviously could just as easily be designed for left-hand users. The unit is made up of a "pistol" grip which fits in the palm of the hand and contains the power source (probably a battery) and most of the driving circuitry. Extending from the grip is the sensor tip that contains the character sensor array and the effector array, which provides the tactile information to the user. The on-off switch is located at the user's thumb.



Hand and unit scanning a line of text.

The Working General Ledger, Accounts Receivable, Accounts Payable.



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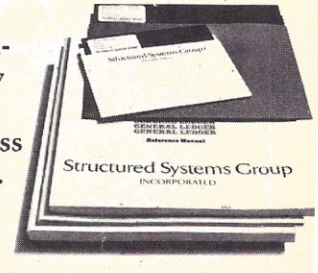

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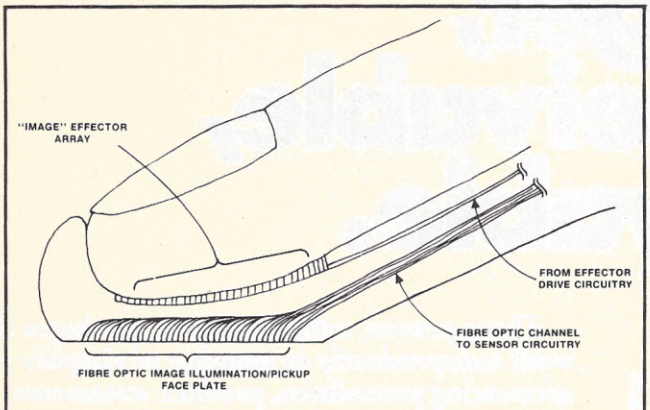
Here we see the unit in use as the user scans the Computing For Home And Business phrase on the cover. You can see that the entire unit fits comfortably in the hand and that the scanning motion is similar to that used to scan braille characters. The user simply moves the sensor tip across the characters.



Cutaway closeup view of image sensor/effector tip.

This shows the sensor tip in a closeup cutaway. On the bottom of the tip is a flat plate made up of the ends of an array of optical fibers. Both illuminate the text and pick up the reflected image, transmitting that image back to the drive circuitry in the pistol grip.

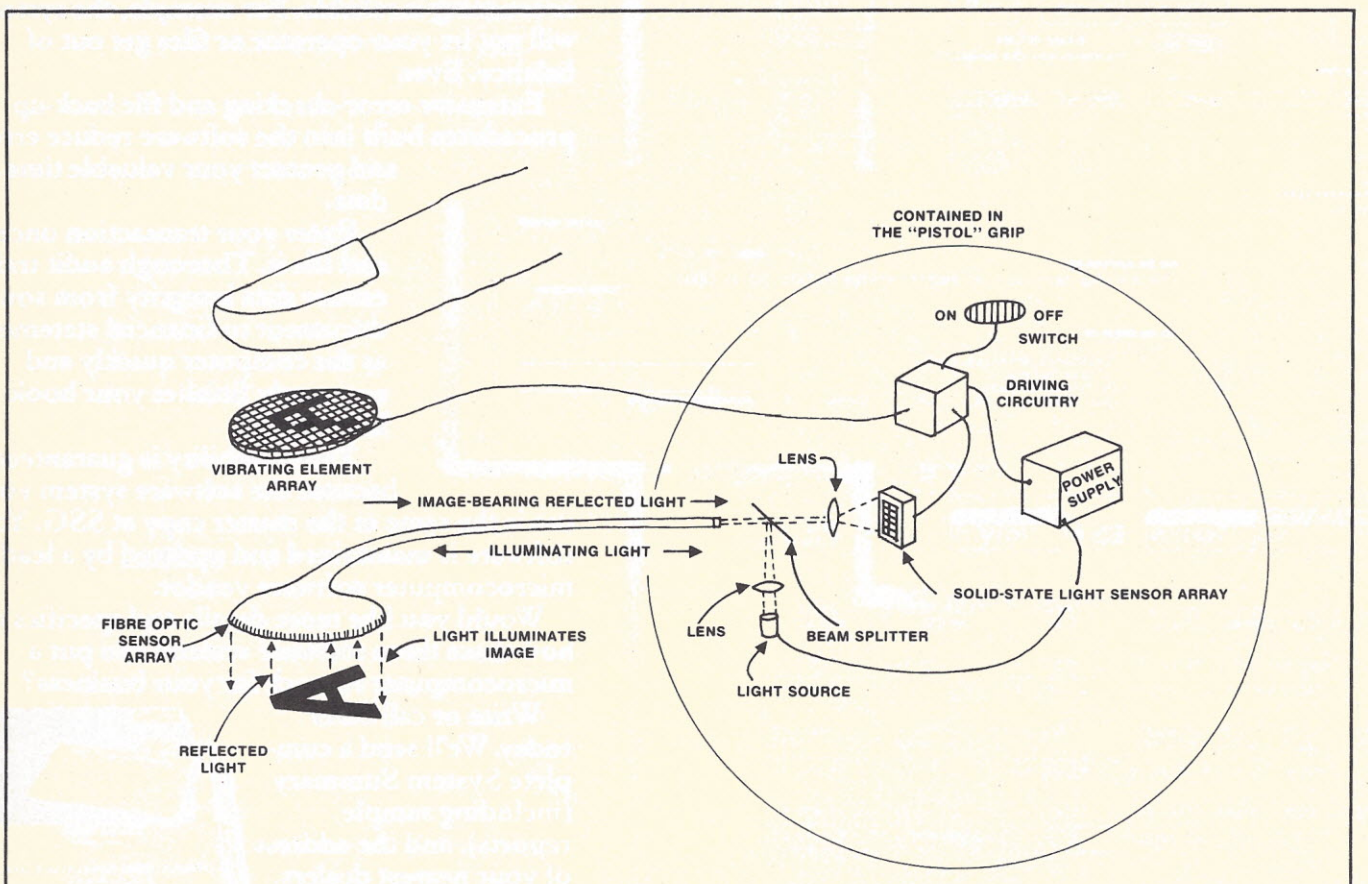
Directly beneath the user's fingertip, and above the fiber-optic faceplate, is an array of effectors that correspond to the vibrating wires in the old design described above. Instead of wires which require space-consuming hardware, however, these effectors are made up of piezoelectric crystals that can be made to vibrate simply by passing a current through them.

This is how the unit works. A light source is focused on the end of the fiber-optic channel via a beam splitter. This light travels down the optical channel and emerges from the optic faceplate to illuminate the text being "read." Note that the figure below shows the faceplate above the character. In actual use, the faceplate would be held in direct contact with the paper.

The light reflected from the character (or whatever is printed on the page) is transmitted back up the optic channel through the beam splitter, and is focused on a solid-state light sensor array, which acts much like a television camera to capture the image but makes the individual pixels (picture elements) of the image individually accessible.

The driving circuitry accesses each of the pixels in the array, determines the intensity of the light falling on it, and causes the matching piezoelectric crystal in the effector array to vibrate at a proportional intensity. To the user, it feels as if the character itself is vibrating, with the darker portions vibrating more intensly and the lighter portions not vibrating at all. Just as the bumps of a braille text can be felt, printed text can now be felt, read, and understood by the blind.

Such a device would only require currently available technology. Unfortunately no one has yet put it together. I am hoping that one of our readers might have the resources or know of a company or corporation that might be interested in pursuing this idea. Please write to me care of Interface Age if you can help. □



Light source focused on end of fiber-optic channel via a beam splitter.

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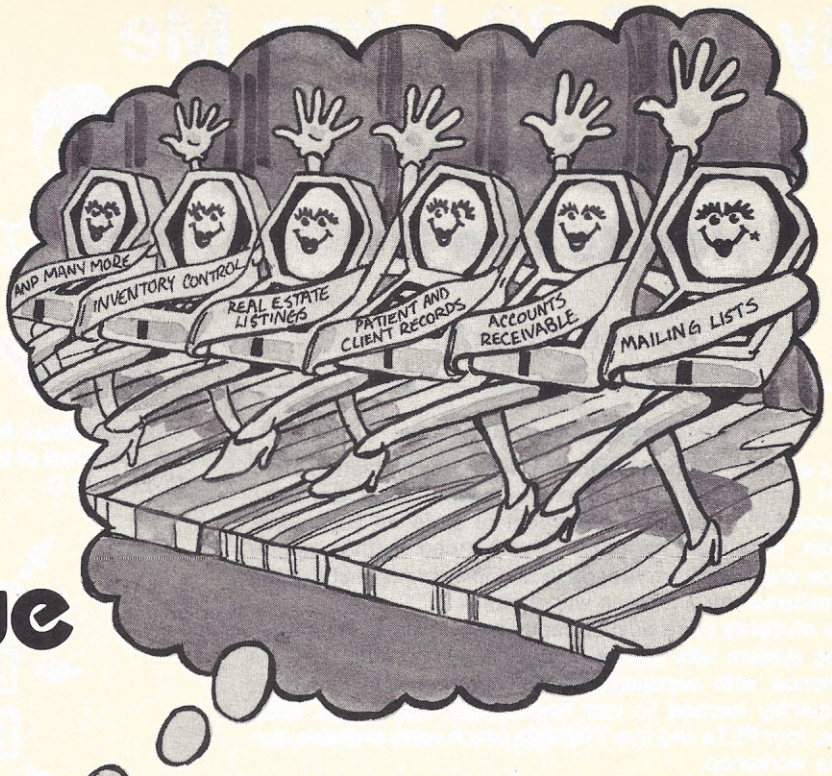

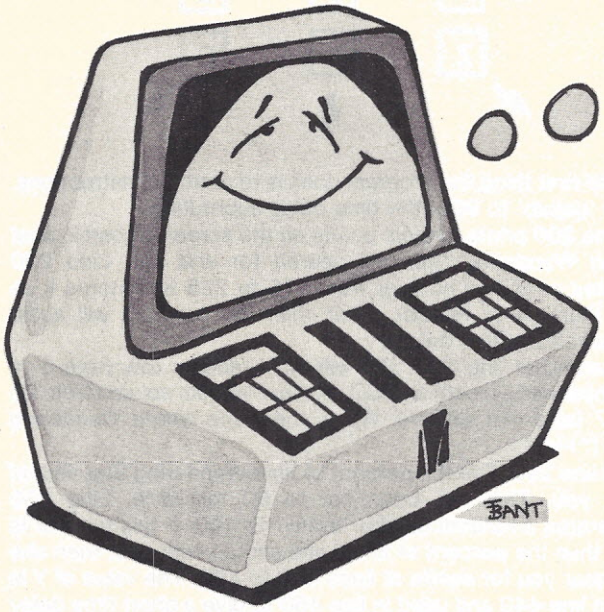

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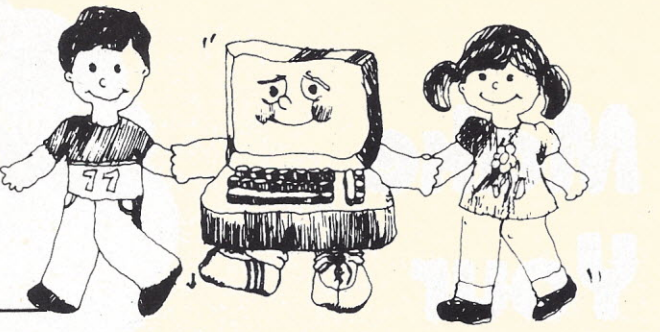
My TRS-80 Likes Me

When I Teach Kids How to Use It

by Bob Albrecht



Wandering Star in Germany

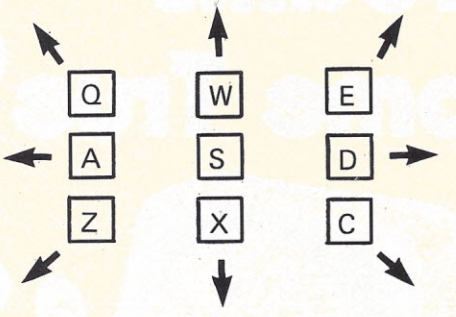
Last summer, we participated in Computer Workshop 1980 at H.H. Arnold High School in Wiesbaden, West Germany, sponsored by the U.S. Department of Defense Dependent Schools. It brought together 26 advanced math/computer science students from American schools throughout Europe to Wiesbaden for a 2-week workshop.

The students were accustomed to using Basic on a time-sharing system with printer output. They had little previous experience with contemporary microcomputers. However, they quickly learned to use two Apples, two Ataris, three Exidys, four PETs and five TRS-80s which were available during the workshop.

One student, Ken Mauldin, was intrigued by Wandering Star. Here is Ken's story and program:

I live in Vaihingen, Germany, but I was in Wiesbaden at a computer workshop when Bob Albrecht gave me the incentive to write this program.

As stated in the program (lines 70-160), Wandering Star will move horizontally, vertically, or diagonally. She will move randomly about half of the time and will accept your prompting about half of the time. To make her move, type Q, W, E, A, D, Z, X, or C.



The first thing the program does is to print the instructions, then 'gosub' to 900, the time delay subroutine.

Line 200 prints random points on the screen—cosmic dust which Wandering Star will search for and eat. Line 230 creates a random number from 175 to 225 and stores it as NM (number of motes). After this, the program will again 'gosub' 900 (time delay).

Starting at line 300, RO will be a random row from 5 to 10 (near mid screen) and CO will be a random column from 27 to 37 (also mid screen). WS is the place where Wandering Star (*) is.

At line 290, P is the percent of time Wandering Star should hear you. This has been set to 50 for 50%. Line 430 generates a random number from 1 to 100. If this number is less than the percent of times she should hear you, then she will hear you for awhile at lines 440 to 480. The value of Y is set in line 440 and used in line 450 to give a short time delay to let you enter your prompt. If you don't do it in that short time, she will wander randomly (lines 510 and 520).

Since the screen is four times as wide as it is high, the probability that Wandering Star moves horizontally should be four times the probability of moving vertically; however, she should also be able to move diagonally at twice the probability routine at 1110, 1120, 1130, or 1140, increasing or decreasing the row or column by one.

The routine at 600 to 680 checks the value of your input key and changes the row or column (or both) by plus or minus one.

Line 710 checks to see if the row or column is too large or too small or if the screen location is 1023 (the bottom right corner of the screen). If it is, the program goes to line 1000. At line 1000, the row is checked to see if it is too large and, if so, the TRS-80 subtracts one from the row value; if the row is too small, it adds one to the row value.

Lines 1030 and 1040 perform similar operations on the column. If the screen location is 1023, then one is subtracted from the column to keep Wandering Star from occupying that position and causing the screen to scroll. After that, the program goes back to line 400 to reaccept prompts or random coordinates.

If the new coordinates are on the screen, then line 810 erases Wandering Star. Line 820 calculates the new coor-

dinates and peeks at the screen location of the new coordinates. If this place is occupied by the Ascii value 46 (the '.'), then the value of R is increased by one to denote the number of times she eats a '.'. An asterisk is printed at the new coordinate over the '.'. Another time delay holds Wandering Star on the screen for a little bit of time.

Line 850 erases the first 11 spaces on the screen and increases the value of L by one. L denotes the number of times which Wandering Star has either moved or been prompted. Then the TRS-80 prints, in those first 11 spaces, first L (the number of moves), then R (the number of motes she has eaten). Line 860 then jumps back to 400 for a new prompt or random move.

This is the concluding article of a series for parents and teachers who wish to help kids learn how to use, program and enjoy the Radio Shack TRS-80. Parts 1 through 3 are available free as an 8-page booklet from Sharon Ross, Radio Shack, Circulation Dept. 3, 1300 One Tandy Center, Fort Worth, TX 76102. □

PROGRAM LISTING

```
0 REM  ***              WANDERING STAR              ***
10 REM  ***   WRITTEN BY KEN MAULDIN 6 JULY 1980    ***
20 REM  ***   ADDRESS:  BOX 1093 -- APO NY 09128    ***
30 REM  ***   SOON TO BE TEXAS TECH  LUBBOCK, TX    ***
40 REM  ***                79409                   ***
50 REM  ***              INSTRUCTIONS              ***
60 CLS
70 PRINT@192, "THE NAME OF THIS PROGRAM IS 'WANDERING STAR', WRITTEN"
80 PRINT "BY KEN MAULDIN.  'WANDERING STAR' WILL MOVE HORIZONTALLY,"
90 PRINT "VERTICALLY, OR DIAGONALLY.  TO PROMPT 'WANDERING STAR'"
100 PRINT "PUSH 'Q' TO MOVE DIAGONALLY UP AND TO THE LEFT; "
110 PRINT "PUSH 'W' TO MOVE VERTICALLY UPWARD, ETC. USING 'Q'"
120 PRINT "'W', 'E', 'A', 'D', 'Z', 'X', 'C', TO MOVE HER."
130 PRINT "THERE IS A LOT OF COSMIC NOISE, SO SHE CANT HEAR YOU"
140 PRINT "ALL OF THE TIME.  GIVEN ENOUGH TIME 'WANDERING STAR'"
150 PRINT "WILL EAT ALL OF THE COSMIC DUST WHICH GIVES HER"
160 PRINT "NURISHMENT."
170 T=6000: GOSUB 900
200 REM ***              COSMIC DUST               ***
210 CLS
220 CLEAR 100
230 NM=RND(225): IF NM<175 THEN 230
240 FOR MN=1 TO NM
250 PRINT @ RND(1023)-1,".";
260 NEXT MN
270 T=1500: GOSUB 900
280 L=0: R=0
290 P=50
300 REM ***       WANDERING STAR APPEARS           ***
310 RO=RND(10): IF RO<5 THEN 310
320 CO=RND(37): IF CO<27 THEN 320
330 WS=64*RO+CO
340 PRINT @ WS,"*";
350 T=1500: GOSUB 900
400 REM ***           ACCEPT PROMPTS               ***
410 REM ***                - OR -                  ***
420 REM ***       NEW RANDOM COORDINATES           ***
430 IF RND(100)<=P THEN 440  ELSE GOTO 500
440 Y=75
450 FOR J=1 TO Y
460 A$=INKEY$
470 IF A$<>""THEN 600
480 NEXT J
500 REM ***       ACCEPTED RANDOM COORDINATES      ***
510 M=RND(7):M=SGN(M-4)
520 C=RND(9): ON C GOSUB 1110 , 1120 , 1120 , 1120 , 1120 , 1130 ,
    1130 , 1140 , 1140
600 REM ***         ACCEPTED PROMPTING             ***
610 IF A$="Q" THEN RO=RO-1: CO=CO-1
620 IF A$="A" THEN CO=CO-1
630 IF A$="W" THEN RO=RO-1
640 IF A$="X" THEN RO=RO+1
650 IF A$="D" THEN CO=CO+1
660 IF A$="Z" THEN RO=RO+1: CO=CO-1
670 IF A$="E" THEN RO=RO-1: CO=CO+1
680 IF A$="C" THEN RO=RO+1: CO=CO+1
700 REM ***              OK TO MOVE?               ***
710 IF RO>15 OR CO>63 OR RO<0 OR CO<0 OR 64*RO+CO=1023 THEN 1000
800 REM ***         WANDERING STAR WANDERS         ***
810 PRINT @WS," ";
820 WS=RO*64+CO: P=PEEK(WS+15360): IF P=46 THEN R=R+1
830 PRINT @WS,"*";
840 T=50: GOSUB 900
850 PRINT@0,"              "; : L=L+1: PRINT@0,L; : PRINT@7,R;
860 GOTO 400
900 REM ***              TIME DELAY                ***
910 FOR S=1 TO T
920 NEXT S
930 RETURN
1000 REM***  ROW OR COLUMN IS TOO LARGE OR SMALL    ***
1010 IF RO>15 THEN RO=RO-1
1020 IF RO<0 THEN RO=RO+1
1030 IF CO>63 THEN CO=CO-1
1040 IF CO<0 THEN CO=CO+1
1050 IF 64*RO+CO=1023 THEN RO=RO-1: CO=CO-1
1060 GOTO 400
1100 REM***      CALCULATE WHICH WAY TO MOVE       ***
1110 CO=CO+M: RETURN
1120 RO=RO+M: RETURN
1130 RO=RO+M: CO=CO+M: RETURN
1140 RO=RO+M: CO=CO-M: RETURN
```

Learning with Micros

by Louis E. Frenzel, Jr.

Learning About Microcomputers by Home Study

Where does a person go to learn about microcomputers? Just how does someone go about learning microcomputer operation, programming, servicing or application? There do not appear to be many clear or obvious sources for such training.

One possible opportunity is a college or university. You can always go to work on a degree in electrical engineering or computer science. Most such programs provide coverage on microcomputers. However, these programs are costly, time consuming and demanding, unless you are seeking a specific degree. No college provides specialized microcomputer education.

Another source for a microcomputer education is books. There are literally hundreds available on the subject. You can learn the digital nitty-gritty of microcomputers in one, programming concepts in another, and applications in still another. However, such an approach is informal and lacks organization and effectiveness. It takes unusual insight, perserverance and motivation to develop a microcomputer learning program with books and then see it through. Nevertheless, books provide a fast and inexpensive way to gain some knowledge about microcomputers.

There are still other ways: Many semiconductor manufacturers conduct resident seminars and workshops covering their specific micros. Some personal computer manufacturers offer short local classes in programming and related subjects. A number of three to five day seminars in microcomputer operation and programming are good for an introduction or overview, but they are not complete enough for career training.

Yet the need in this area is tremendous. Manufacturers, retailers, and software houses are hungry for qualified people. Few are available. Yet one of the oldest sources of education in the United States has responded to this need: the home-study schools. Surprised?

A home-study school offers correspondence courses on a range of subjects. Most are private institutions specializing in one subject area. Many colleges and universities have a home-study division for college credit. In either case, the courses are designed to be taken by an individual at home. The school mails learning materials to the student and, in most cases, administer graded tests.

Some of the learning activities consist of reading and studying especially-prepared home study texts, listening to audio cassettes, and perhaps performing demonstrations and experiments on some equipment. Together, these learning activities form an effective educational program in a specific subject.

How do home-study courses stack up against more formal programs and book learning? In comparing a home-study course to a college degree program, you have to realize that the degree program is far more comprehensive in breadth and depth. Home-study courses usually concentrate on a single rather than a range of subjects. Because of this specialization, a student gets needed information in a shorter period at lower cost. You won't get the prestige of a degree, but you will get the knowledge and skills.

Compared to book-learning, home study is more expensive, but more thorough. It is a planned, formal program that takes you through a logical sequence of subjects, which is far more effective than trying to gain knowledge by reading on your own.

There are several home-study schools currently offering courses in micros. Two of the most comprehensive are offered by National Technical Schools in Los Angeles and McGraw-Hill's NRI schools in Washington, D.C. Short self-instructional courses in select topics are also offered by Heath/Zenith's Heathkit continuing education division.

National Technical School's master course in microcomputers is a comprehensive program that approaches the subject from an electronics hardware point of view. The first part teaches basic electricity and electronics. Digital logic fundamentals are covered extensively. The latter part of the course is a comprehensive introduction to hardware. The program concludes with information on programming in Basic and assembly language.

One of the main features of the NTS course are kits that simulate hands-on hardware to learn how it works. The NTS course also comes with a digital multimeter, a logic trainer, a logic probe and, best of all, a complete microcomputer kit... the Heathkit H-88 all-in-one featuring a complete video terminal and a Z-80 CPU.

The basic unit comes with an audio cassette interface; however, a single mini-floppy drive and interface are offered as an expansion. Kits are included in the price of the course, which costs about $2,500. This may seem high until compared with an equivalent form of education. And you get to keep the hardware.

Overall, its an excellent value. Depending on learning speed, the course takes about 28 months to complete. Shorter, lower-cost versions are available for those who already know electronic fundamentals and digital logic. For

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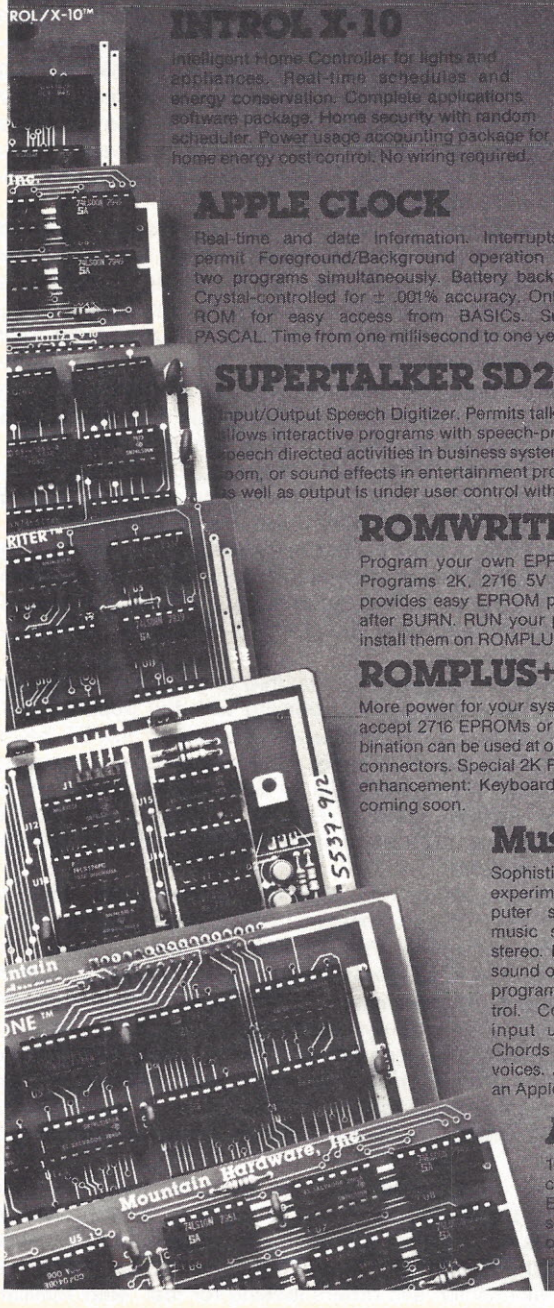

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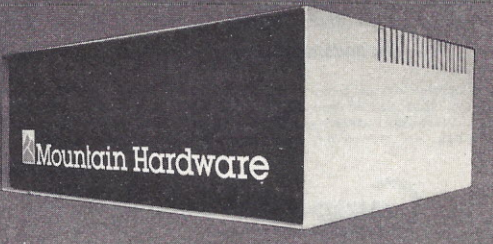

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Program your own EPROMs. Create your own firmware. Programs 2K, 2716 5V EPROMs. Disk software package provides easy EPROM programming. EPROMs are verified after BURN. RUN your programs from on-board socket or install them on ROMPLUS+.

ROMPLUS+

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more information, write National Technical Schools, 4000 South Figueroa St., Los Angeles, CA 90037.

Another school offering microcomputer training is NRI schools, a division of McGraw-Hill. Its course in microcomputers and microprocessors is similar in approach and content to the NTS program. Emphasis is primarily on hardware. The course begins with electronic fundamentals, digital logic and computer basics. The final part covers microprocessors and microcomputers in detail, including software and programming.

The NRI course also includes kits. You build a transistorized volt-ohm meter, CMOS frequency counter, and breadboard for hardware experiments. Also supplied is the popular Radio Shack TRS-80 model I with level II Basic and 4K of RAM and audio cassette mass storage. The base price for this course is $1,895. Write NRI Schools, McGraw-Hill Continuing Education Center, 3939 Wisconsin Ave., NW, Washington, DC 20016, for a free catalog.

There does not appear to be any similar source for microcomputer training, home study, resident school or otherwise that offer such complete coverage. Either course can provide a firm entry base for microcomputer jobs at the technician level. And either one makes an excellent continuing education program for engineers, technicians or scientists looking to up-grade their knowledge. While the price may appear steep, keep in mind that each course supplies a complete microcomputer and many other pieces of hardware. If you have been looking for a way to justify the purchase of a microcomputer, how about education?

Incidentally, both the NRI and NTS courses are approved by the VA for 90% reimbursement under the GI bill for qualified veterans. (Note: As of this writing Congress is debating dropping home-study education from VA benefits.) Many employers will also pay for such a course under their regular tuition reimbursement plans. Check with your supervisor or the personnel office for more details. Finally, you may be able to deduct the price of such a course from your income tax, if it helps you to hold a job or do it more competently.

Heath Company's Heathkit Continuing Education Division offers a different approach to microcomputer learning. HCE courses are shorter and more specific than NRI or NTS.

One of Heath's most popular is its EE-3401 microprocessor program, which teaches operation, application and programming. It assumes a knowledge of electronic fundamentals and digital techniques, and offers short, self-study courses in these as well.

The Heath microprocessor course emphasizes interfacing and machine language programming with the popular 6800 microprocessor. An accompanying kit trainer, the ET-3400, allows you to perform a variety of hardware and programming experiments. The course sells for $99.95 and the trainer for $199.95. Smaller, shorter versions of these products, the EC-6800 course ($29.95) and the ET-6800 trainer ($129.95) are also available.

In addition, Heath offers several programming courses. These include a programmed instruction course on Basic programming and another that teaches assembly language programming. The Basic course assumes no prior knowledge of computers or programming. The course is general in nature and applicable to virtually any computer. It sells for $39.95.

The assembly language programming course features the 8080 microprocessor. Techniques and procedures are explained in detail; cost is $49.95. Both courses provide practical experiments and demonstrations on a computer, if you have one.

A newer Heath program is the EC-1000 Personal Computing Course, presented in audio cassette format covering the basics of computer operation and programming for those who need only a short introduction. It is ideal for managers, small businessmen and others looking for fast, easy familiarization with micros. Heath is said to be developing programming courses in Pascal, Fortran and Microsoft Basic. Write Heath Company at Benton Harbor, MI 49022, for a catalog. □

HOW FINDEX WON!

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Delivery: 30 days

FINDEX—No need for peripherals

Not a toy!

FINDEX is a fully portable, inexpensive, feature-packed business computer designed for the professional. FINDEX uses the latest technology: bubble memory, flat gas plasma display, built-in 80-132 column, plain paper printer.

This terminal sized computer can have up to 2 million characters of non-volatile solid state bubble memory mass storage, or up to 400,000 characters on an inexpensive built-in mini-floppy diskette drive; random access memory from 64 kilobytes to 2 megabytes. It interfaces to a variety of peripherals, such as fast printers, or hard disk drives (up to 195 megabytes).

It has I/O expandability: serial, parallel and S-100 Bus interface is standard. Audio-cassette recorder jacks and acoustic coupler are optional.

No sorting!

FINDEX is programmable in easy to use Business BASIC. It supports also a full ANSI FORTRAN, COBOL 74 or a BASIC compiler, as well as a MACRO assembler. APL and PASCAL can be used too. The 26k BASIC includes a comprehensive file management capability. There is no loss of time for data to be sorted. As data is typed in, it is immediately entered in its proper place in the desired order: alphabetical, zip code, price, quantity, etc. There is no loss of time for retrieving data either. The computer will access the requested data directly without going through any lengthy search.

Powerful!

The FINDEX BASIC is the most extensive Z-80 BASIC language available.

- Direct access to CPU I/O ports (INP,OUT);
- Ability to read or write any memory location (PEEK,POKE);
- Matrices with up to 255 dimensions;
- Error trapping;
- Fully formatted print output (tab, asterisk fill, floating $ sign, scientific notation, trailing sign, comma insertion, etc.);
- Extensive string functions as well as complete mathematical functions; 16 digit precision;
- Sequential files with variable length record;
- Random files (record I/O).
- Linked keys (any string) indexed sequential files —no need for sorting!
- Dynamically written variable length records and fields;
- Programs merging;
- Multiple statements on one line;
- Ability to call up to 10 assembly language subroutines.

Fully portable!

FINDEX weighs 31 pounds (14 kg.) and can be taken along in its carrying case on airplanes or in cars. Wherever you go FINDEX goes with you. Its battery back-up (optional) and built-in printer grant you independence from heavy peripherals. FINDEX has the programming power of an expensive mini computer for a fraction of its cost.

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THE MICRO-MATHEMATICIAN

by Richard R. Parry

Function Plotter

Visualizing a function that describes a relationship is as important to the engineer and calculus student as it is to the businessman. Take, for example, the engineer who may know that a function represents a relationship between current and voltage but, if the relationship is somewhat complex, the best way to grasp it is by plotting.

For the businessman, plotting a function that describes business cycle fluctuations may be invaluable in aiding decision making. After all, one picture is worth a thousand words.

Functions such as $Y = X$ and $Y = X^2$ are almost intuitively obvious. Other functions like $Y = X^2 + X + 1$ and $Y = 3X^3 + X + X/2$ may not be quite so obvious. However, by plotting a few points, one gets a good feel for the shape of the function. As complexity increases, plotting a function becomes a chore best suited to a room full of monkeys or a computer. The latter alternative to plotting functions is a lot quicker and neater.

The Basic program that follows was written using Technical Systems Consultants' Basic. It allows one to plot either of two user-defined functions, or plot both simultaneously. This latter ability allows one to indirectly solve simultaneous equations since the graph will indicate the intersection of the functions, if such a point exists.

Before running the program, the user must define the functions to be plotted. The program shows function 1 defined on line 20, and function 2 defined on line 40. With the functions defined, the program is ready to be run. The user indicates his selection by answering 1,2, or 'both' to the question 'plot function 1,2,' or 'both (1,2,B)'. Answering with 'both' or B is equally acceptable since the program only examines the first character of the response.

Figure 1 shows the plot of the function SIN(X) + 2. Note that the minimum value of Y is not 0 on the graph. If the minimum value of Y was 0, the graph would be more compressed since the Y range would be 3 (3 – 0), rather than 2 (3 – 1) which is shown. This characteristic of the program to automatically adjust the range of the Y axis for a given X range greatly enhances the accuracy of the graph.

```
PLOT FUNCTION 1, 2, OR BOTH (1,2,B)? 1
LOWER LIMIT OF X=? -3
UPPER LIMIT OF X=? 3
INCREMENTS OF X=? .25
X AXIS LABEL=?          X AXIS
Y AXIS LABEL=?                  Y=SIN(X)+2
Y INCREMENT= .04
Y AXIS AT X= 0
X AXIS AT Y=  1

                        Y=SIN(X)+2
          1         1.4        1.8        2.2        2.6        3
          +.........+.........+.........+.........+.........+.........+
X -3      |                    *
  -2.75   |                *
A -2.5    |            *
X -2.25   |        *
I -2      |    *
S -1.75   |  *
  -1.5    |*
  -1.25   |*
  -1      |  *
  -.75    |      *
  -.5     |          *
  -.25    |              *
   0      |----------------------*----------------------
   .25    |                      *
   .5     |                        *
   .75    |                          *
   1      |                            *
   1.25   |                              *
   1.5    |                              *
   1.75   |                              *
   2      |                            *
   2.25   |                          *
   2.5    |                        *
   2.75   |                      *
   3      |                    *
```

Figure 1. A sample run of a single function Y = SIN(X) + 2. Note that the X axis is located at Y = 1, thereby insuring the highest resolution of the function on the graph.

```
PLOT FUNCTION 1, 2, OR BOTH (1,2,B)? BOTH
LOWER LIMIT OF X=? -7
UPPER LIMIT OF X=? 7
INCREMENTS OF X=? .5
X AXIS LABEL=?          X AXIS
Y AXIS LABEL=?          Y1=20*COS(X)          Y2=X*X
* INDICATES FUNCTION 1
. INDICATES FUNCTION 2
X INDICATES FUNCTIONS COINCIDE
Y INCREMENT= 1.4
Y AXIS AT X= 0
Y AXIS AT Y= -.400003

                        Y1=20*COS(X)          Y2=X*X
          -20         -6          8          22         36         50
          +.........+.........+.........+.........+.........+.........+
X -7      |                                *
  -6.5    |                                  *
A -6      |                                    *
X -5.5    |                                      *
I -5      |                                  *
S -4.5    |                              *
  -4      |                            *
  -3.5    |                          *
  -3      |                        *
  -2.5    |                      *
  -2      |                    *
  -1.5    |                  *.
  -1      |                *.
  -.5     |              *.
   0      |-------------.----------*---------------------
   .5     |              .*
   1      |                .*
   1.5    |                  .*
   2      |                    .*
   2.5    |                      .*
   3      |                        .*
   3.5    |                          .*
   4      |                            .*
   4.5    |                              .*
   5      |                                .*
   5.5    |                                  .*
   6      |                                    .*
   6.5    |                                      .*
   7      |                                        .*
```

Figure 2. Sample run showing two functions plotted simultaneously. Equations can be indirectly solved using this plotting technique. Note the ability of the program to plot functions in all four quadrants of the graph.

Figure 2 shows two functions plotted simultaneously. By merely changing the X increment and range, one can study an area of the graph in greater detail. For example, to examine the point of intersection of these two functions, the X increment could be changed from 0.2 to 0.1, thereby increasing the resolution by a factor of 20. This obviously gives a plot 20 times the original length. Although a hardcopy terminal would not suffer by this, such a long X axis would be an impediment on a CRT terminal, since the graph would scroll off the screen. To overcome this, the range of X may be changed to

CP/M* compatible software

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accounts payable:
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- invoice aging

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- customer statements
- partial invoice payments
- invoice aging

The entire package is menu driven and easy to learn and use. It incorporates error checking and excellent user displays. This package can be used stand alone or with the General Ledger below.

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GENERAL LEDGER: A complete, user oriented package which features:

- Accepts postings from external programs (i.e. AP/AR above)
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- Financial reports: trial balance, income statement balance sheet, and more.

Completely menu driven and easy to learn and use. Excellent displays and error checking for trouble free operation. Can be used stand alone or with Accounts Payable/Receivable above.

Supplied with extensive user manual: $200.00. Manual alone: $20.00.

Both require 48K CP/M, terminal with cursor positioning, home and clear home, one 8" disk or Two 5" disks. CBASIC2 required.

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TFS—Text Formatting System: An extremely powerful formatter. More than 50 commands. **Supports all major features including:**

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TFS lets you make multiple copies of any text. For example: Personalized form letters complete with name & address & other insertions from a disk file. Text is not limited to the size of RAM making TFS perfect for reports or any big job.

Text is entered using CP/M standard editor or most any CP/M compatible editor. TFS will link completely with Super-M-List making personalized form letters easy.

Requires: 24K CP/M.

Supplied with extensive user manual: $85.00. Manual alone: $20.00.

Source to TFS in 8080 assembler (can be assembled using standard CP/M assembler) plus user manual: $250.00.

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SUPER-M-LIST: A complete, easy to use mailing list program package. Allows for two names, two address, city, state, zip and a three digit code field for added flexibility. Super-M-List can sort on any field and produce mailing labels direct to printer or disk file for later printing or use by other programs. Super-M-List is the perfect companion to TFS. Handles 1981 Zip Codes!

Requires: 48K CP/M.

Supplied with complete user manual: $75.00. Manual alone: $10.00

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Utility pack #1: A collection of programs that you will find useful and maybe even necessary in your daily work (we did!). Includes:

- CMP: Compare two files for equality.
- ARCHIVER: Compacts many files into one, useful when you run out of directory entries.
- SORT: In core sort of variable length records.
- XDIR: Extended, alphabetical directory listing with groupings by common extension.
- PRINT: Formatted listings to printer.
- PG: Lists files to CRT a page at a time.

. . . plus more . . .

Requires: 24K CP/M.

Supplied with instructions on discette: $50.00.

PROGRAMMING LANGUAGES

FORTH: a full, extended FORTH interpreter/compiler produces COMPACT, ROMABLE code. As fast as compiled FORTRAN, as easy to use as interactive BASIC.

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- WHILE
- 'PEAK' & 'POKE'
- READ & WRITE
- REPEAT . . . UNTIL
- more

'Tiny' Pascal is fast. Programs execute up to ten times faster than similar BASIC programs.

SOURCE TOO! We still distribute source, in 'Tiny' Pascal, on each discette sold. You can even recompile the compiler, add features or just gain insight into compiler construction.

'Tiny' Pascal is perfect for writing text processors, real time control systems, virtually any application which requires high speed. Requires: 36K CP/M. Supplied with complete user manual and source on discette: $85.00.

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ENCODE/DECODE: A complete software security system for CP/M. Encode/Decode is a sophisticated coding program package which transforms data stored on disk into coded text which is completely unrecognizable. Encode/Decode supports multiple security levels and passwords. A user defined combination (One billion possible) is used to code and decode a file. Uses are unlimited. Below are a few examples:

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- inventory
- payroll files
- correspondence
- accounts pay/rec
- programs
- tax records
- mailing lists

Encode/Decode is available in two versions:

Encode/Decode I provides a level of security suitable for normal use. Encode/Decode II provides enhanced security for the most demanding needs. Both versions come supplied on discette and with a complete user manual.

Encode/Decode I: $50.00
Encode/Decode II: $100.00 Manual alone: $15.00

INTERCOMPUTER COMMUNICATIONS

TERM: a complete intercommunications package for linking your computer to other computers. Link either to other CP/M computers or to large timesharing systems. TERM is comparable to other systems but costs less, delivers more and source is provided on discette!

With TERM you can send and receive ASCII and Hex files (COM too, with included convertion program) with any other CP/M computer which has TERM or compatible package. Allows real time communication between users on separate systems as well as acting as timesharing terminal.

- Engage/disengage printer
- error checking and auto retry
- terminal mode for timesharing between systems
- conversational mode
- send files
- receive files

Requires: 32K CP/M.

Supplied with user manual and 8080 source code: $110.00

Manual alone: $15.00.

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the area of interest which would easily allow the area to be examined at increased resolution.

The Basic is relatively straightforward and the liberal use of REM statements should make it easy to understand. However, there are a few points worth noting. First, the X axis is not always at Y = 0, nor is the Y axis always at X = 0. Looking at figure 2, one can see that, since the Y increment is 1.4, the Y axis steps are: −20, −18.6, −17.2,... −.4, +1, +2,... +50. Note that Y = 0 is skipped over. The closest that Y approaches 0 is −0.4. Not showing the X or Y axes would be a grave mistake, since they greatly aid in reading the graph. To overcome this apparent dilemma, the locations of the X and Y axes are calculated and displayed. In the example, the output shows the Y axis at X = 0, and the X axis at Y = −0.4.

Also noteworthy is the manner in which the minimum and maximum Y values are computed. They are calculated in a straightforward manner from the supplied functions in lines 200 through 330. However, they are then transformed. The reason for this change may not be readily apparent. Take, for example, the simple function Y = 41.567(X). If one were to plot this function between X = −1 and X = +1, the minimum and maximum values of Y would be −41.567 and +41.567, respectively. In addition, the Y increment would be 1.66268 [(41.567 + 41.567)/50].

Such a graph would be very difficult to read. However, by rounding the minimum value of Y to two significant digits (lines 340 to 450), and then changing the maximum value of Y so it is evenly divisible by 50 (lines 460 to 520), the minimum and maximum values of Y become −42 and +43, respectively, with an increment of 1.7. The accuracy is maintained while making the graph much easier to read. The reason for making the range divisible by 50 is because 50 columns are devoted to the actual graph. In other words, the Y axis consists of 50 divisions. An additional 10 columns are devoted to the X title and values. Therefore, all graphs are 60 columns wide.

In some cases, the format of the supplied function must be altered. For example, if one were to plot Y = X, and defined the function as Y = X ∧ 2, Basic would flag an error message for values of X less than 0. The reason for this error stems from the way in which Basic interprets X ∧ 2. All exponential expressions are solved through a logarithm routine. Since one cannot solve for the log of a negative number, an error message would be indicated. By modifying the expressions from X ∧ 2 to X * Y, the function may be plotted and no error message will be flagged.

In a similar vein, trying to plot 1/(X − 1) would also yield an error message for a value of X = +1, since dividing by zero is not legal. Some ingenuity can be used to solve this apparent problem as well. By setting the range and X increment in such a way as to skip over X = +1, such an error would not be detected. For example, a lower X limit of −5 and an upper limit of +5 with an X increment of 1.5 would mean that X would never be +1. The closest X would approach +1 would be +.5.

Lastly, there are some functions that the program cannot plot. These functions are ones which have more than one Y value for a given X. A circle is a typical example. The standard equation for a circle is $r^2 = X^2 + Y^2$. Rearranging the equation as a funciton of Y yields $Y = \sqrt{r^2 - X^2}$. Assuming a radius of 3 and X = 0, Y = +3 and Y = −3 both satisfy the equation. If Basic were to interpret this function, only Y = +3 would be found. For this reason, only functions with a unique value of Y for a given X will plot correctly. □

Function plotter program written in TSC Basic. The user defined functions are shown on lines 20 and 40.

```
10 REM **** PLACE FUNCTION 1 HERE
20 DEF FNY1(X)= 20 * COS(X)
30 REM **** PLACE FUNCTION 2 HERE
40 DEF FNY2(X)= X * X
50 REM **** LEAVE 10 SPACES FOR X AXIS LABEL
60 LC=10
```

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```
 70 INPUT "PLOT FUNCTION 1, 2, OR BOTH (1,2,B)";K$
 80 IF LEFT$(K$,1)="B" THEN K=3: GOTO 100
 90 IF K$='1' OR K$='2' THEN K=VAL(K$) ELSE 70
100 INPUT "LOWER LIMIT OF X=";L1
110 INPUT "UPPER LIMIT OF X=";L2
120 IF L2=L1 OR L2<L1 GOTO 100
130 INPUT "INCREMENTS OF X=";L3
140 INPUT "X AXIS LABEL=";X$
150 INPUT "Y AXIS LABEL=";Y$
160 IF K<>3 GOTO 200
170 PRINT "* INDICATES FUNCTION 1"
180 PRINT ". INDICATES FUNCTION 2"
190 PRINT "X INDICATES FUNCTIONS COINCIDE"
200 REM **** INITIALIZE Y3(MIN) AND Y4(MAX)
210 Y3=1E10:Y4=-1E10
220 IF K=2 GOTO 290
230 REM **** COMPUTE MIN AND MAX OF FUNCTION 1
240 FOR X=L1 TO L2 STEP L3
250 IF FNY1(X)<Y3 THEN Y3=FNY1(X)
260 IF FNY1(X)>Y4 THEN Y4=FNY1(X)
270 NEXT X
280 IF K=1 GOTO 340
290 REM **** COMPUTE MIN AND MAX OF FUNCTION 2
300 FOR X=L1 TO L2 STEP L3
310 IF FNY2(X)<Y3 THEN Y3=FNY2(X)
320 IF FNY2(X)>Y4 THEN Y4=FNY2(X)
330 NEXT X
340 REM **** ROUND MIN (Y3) TO 2 SIGNIFICANT DIGITS < ORIGINAL VALUE
350 IF Y3=0 GOTO 460
360 Z=INT(LOG(ABS(Y3))/LOG(10)-1)
370 IF SGN(Y3)=-1 GOTO 430
380 REM **** Y3 IS POSITIVE
390 IF Y3<1 THEN Y3=INT(Y3*10^ABS(Z))/10^ABS(Z) : GOTO 460
400 IF Y3<10 THEN Y3=INT(Y3*10)/10 : GOTO 460
410 GOTO 450
420 REM **** Y3 IS NEGATIVE
430 IF Y3>-1 THEN Y3=-(INT(ABS(Y3)*10^ABS(Z)+1))/10^ABS(Z): GOTO 460
440 IF Y3>-10 THEN Y3=INT(Y3*10)/10 : GOTO 460
450 Y3=INT(Y3/10^Z)*10^Z
460 REM **** REPLACE MAX (Y4) WITH MULTIPLE OF 50
470 REM **** IF Y3 EQUALS Y4, SKIP CALCULATION, SET INCREMENT TO Y3
480 IF Y3=Y4 THEN Y5=Y3 : GOTO 510
490 Z2=5*10^(INT(LOG(Y4-Y3)/LOG(10)-1))
500 Y5=(Z2*(INT((Y4-Y3)/Z2)+1))/50
510 PRINT "Y INCREMENT=";Y5
520 Y4=Y5*50+Y3
530 REM **** CALCULATE LOCATION OF Y AXIS
540 FOR X=L1 TO L2 STEPL3
550 IF X=L2 GOTO 570
560 IF ABS(X)>=ABS(X+L3) GOTO 580
570 PRINT "Y AXIS AT X=";X:X4=X: GOTO 590
580 NEXT X
590 REM **** COMPUTE SCALE FACTOR BASED ON MAX AND MIN Y
600 K1=50/ABS(Y3-Y4)
610 REM **** COMPUTE COLUMN OF X AXIS (K4)
620 FOR X=Y3 TO Y4 STEP Y5
630 IF X=Y4 GOTO 650
640 IF ABS(X)>=ABS(X+Y5) GOTO 670
650 PRINT "X AXIS AT X= ";X
660 K4=INT(ABS((X-Y3)*K1)+.5)+LO: GOTO 680
670 NEXT X
680 REM **** PRINT LABEL OF Y AXIS AND Y SCALE
690 PRINT :PRINT :PRINT :PRINT TAB(20);Y$
700 PRINT TAB(LO-3);Y3;
710 PRINT TAB(LO+7);.2*(Y4-Y3)+Y3;
720 PRINT TAB(LO+17);.4*(Y4-Y3)+Y3;
730 PRINT TAB(LO+27);.6*(Y4-Y3)+Y3;
740 PRINT TAB(LO+37);.8*(Y4-Y3)+Y3;
750 PRINT TAB(LO+47);Y4
760 REM **** PRINT Y AXIS LINE
770 PRINT TAB(LO);"+.........+.........+.........+.........+.........+"
780 REM **** FOR ALL X POINTS COMPUTE Y AND PRINT GRAPH
790 FOR X=L1 TO L2 STEP L3
800 REM **** PRINT LABEL OF X AXIS
810 F1=F1+1:PRINT MID$(X$,F1,1);TAB(2);X;
820 REM **** COMPUTE Y FOR GIVEN X FOR FUNCTION 1 AND NORMALIZE
830 K2=INT((FNY1(X)-Y3)*K1+.5)+LO
840 REM **** COMPUTE Y FOR GIVEN X FOR FUNCTION 2 AND NORMALIZE
850 K3=INT((FNY2(X)-Y3)*K1+.5)+LO
860 REM **** PRINT Y AXIS
870 IF F=1 OR X<>X4 GOTO 1000
880 PRINT TAB(LO);
890 FOR I=LO TO (LO+50)
900 IF K=3 AND I=K2 AND I=K3 THEN PRINT "X";: GOTO 950
910 IF I=K2 AND K<>2 THEN PRINT "*";: GOTO 950
920 IF I=K3 AND K<>1 THEN PRINT ".";: GOTO 950
930 IF I=K4 THEN PRINT "I";: GOTO 950
940 PRINT "-";
950 NEXT I
960 F=1:PRINT : GOTO 1120
970 REM **** PRINT POINT FOR FUNCTION 1 (K2)
980 REM **** PRINT THE X AXIS POINT IF APPLICABLE (K4)
990 REM **** PRINT POINT FOR FUNCTION 2 (K3)
1000 FOR I=LO TO (LO+50)
1010 PRINT TAB(I);
1020 IF K=3 AND I=K2 AND I=K3 THEN PRINT "X";: GOTO 1070
1030 IF I=K2 AND K<>2 THEN PRINT "*";: GOTO 1070
1040 IF I=K3 AND K<>1 THEN PRINT ".";: GOTO 1070
1050 IF I=K4 THEN PRINT "I";: GOTO 1070
1060 REM **** IF ALL POINTS ARE PLOTTED FOR PARTICULAR X, EXIT
1070 IF K=1 AND I>K2 AND I>K4 GOTO 1110
1080 IF K=2 AND I>K4 AND I>K3 GOTO 1110
1090 IF K=3 AND I>K2 AND I>K4 AND I>K3 GOTO 1110
1100 NEXT I
1110 PRINT
1120 NEXT X
1130 END
```

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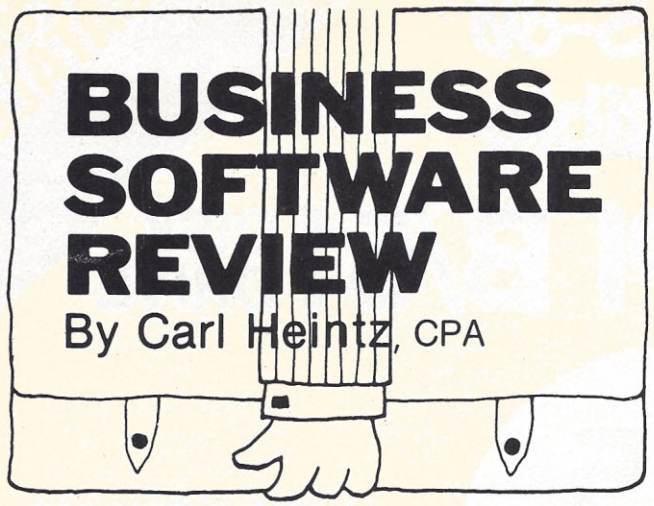


Analyst: Another Data-base Manager

The focus this month is on a new program produced by the Stuctured Systems Group (Oakland, CA), and also updates a previous review of their general ledger package.

Analyst is a group of programs, produced in C-Basic, designed to be run on any Z-80 or 8080 computer with at least 48K and one floppy disk. To effectively utilize the programs, one should have a working knowledge of CP/M and experience with C-Basic.

Analyst is essentially a data-base management program for inputting information, selecting elements of the file and outputting them in report format. Its name is somewhat misleading, since one would assume that the program is used for preparing analyses, projections or columnar worksheets, like those used in a cash forecast. Such is not the case.

Analyst, unlike most general ledgers which can be implemented with little or no knowledge of what the operating system is doing, requires that the user have an elementary knowledge of how CP/M handles files.

This shouldn't frighten an inexperienced user, since a manual goes to great lengths to discuss the implications of what the instructions call for.

Analyst has five major functions: (1) system menu; (2) defining a data file; (3) creating or modifying the data file; (4) defining a report; and (5) printing out a report. These are almost universal in this type of program, i.e., the CCA data management system, Selector by MicroAp and others use the same strategy. What is different about Analyst is that it uses the C-Basic language, and has a few twists in actual implementation.

Analyst is a good exercise in how to establish and effectively utilize a data-base system. The instruction book gives elementary lessons on what to consider in establishing a data base—what elements are necessary and how those elements interact.

The power of a data-base manager depends on the ability of the program to effectively interact with the user and the data, which is input and organized into reports. The following tests can be specified as input edit parameters.

Numeric
Money
Date
Literals (descriptions, etc.)

In addition, when the user inputs data, tests are applied to ascertain that the data fits within the field sizes specified, and tests to insure no unacceptable characters are entered. (e.g., 4r/23/80.)

The most important aspect of any data-base management system is to derive output that will satisfy the user's needs. In the case of Analyst, there are a few twists that can make the package immensely powerful:

- The ability to print all the detail, or alternatively, just the sum of certain items
- The ability to format headings with almost total flexibility
- The ability to have multiple accumulators operating at the same time (so as to get subtotals, sub-subtotals, etc.)
- Logical record selection procedures for the selection of data using numerous tests.

The system has limitations, of course: there can only be 50 accumulators, and a maximum of 10 level breaks. A level break corresponds to a change in a value of a data file item. In other words, the system can have 10 levels of "decision" items; somewhat analogous to an outline:

```
1 A.
2     I.
3         1.
4             a.
5                 i.
6                     1.
etc.
```

When records are being scanned for inclusion in the reports, the user can apply tests to include or exclude data. These include:

Match — where one or more fields must equal certain things (such as all items that have a code of '4r' or all the sales for 1/21/81).

Range — where a record is selected if parameters fall within a range specified.

Not Match or *Not Range* — records are selected if the parameters do not match or are not in the range specified.

The record selection procedure can include multiple tests such as:

(A and B) or C

Additionally, one can set "wild cards" in the match criteria, which allows one to specify, for example:

Ralph ??wn

which would select the following:

Ralph Brown Ralph Down Ralph Gown Ralph Sewn

and so forth. There are wild card selectors for numbers only, letters only, or letters and numbers.

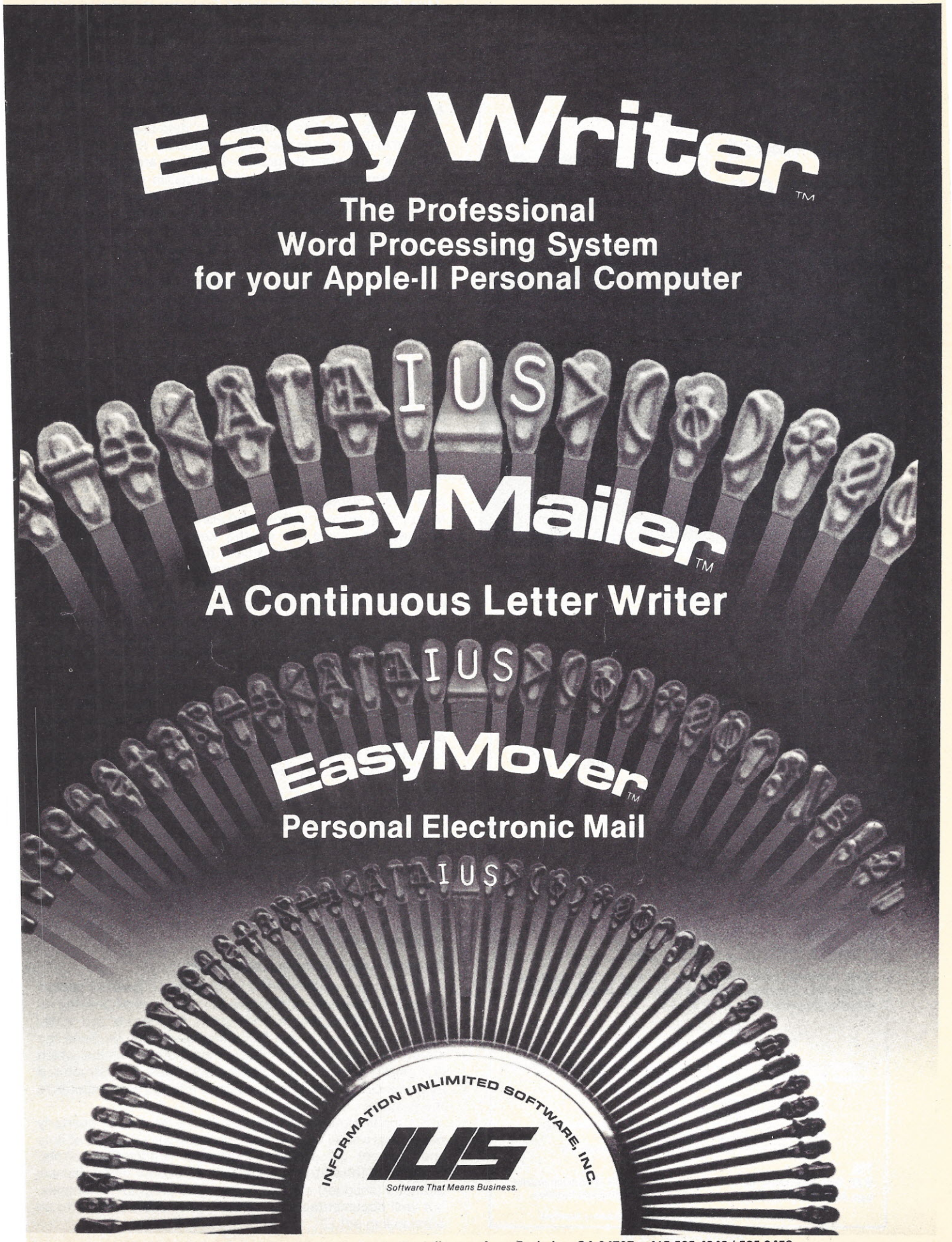
Is anything missing from the output programs? Reviewing other products on the market, there are a few:

- The user cannot sum columns—i.e., one cannot define one column as the sum of two others, or perform arithmetical calculations on the columns.
- The user cannot have the program compute percentages by itself. This would be useful, for example, in a sales report, if each salesman's percentage contribution to total sales could be shown.
- The "perfect" data-base manager should have the ability to prepare simple graph functions, such as a bar chart or simple dot graph. Increasingly, with the complexity of data, users want simple graphs. Most printers have at least one good graphics symbol—the '.' or '*' which just aren't used.

Analyst is designed as a production program—i.e., for continual use in an applications environment. The user can in essence write a sophisticated applications program with little programming knowledge.

The key to the production usefulness of Analyst is the efficiency of data input. Its input/edit/review functions are easy to use and oriented towards speed, apparently being borrowed in part from other programs.

To be efficient, Analyst needs a companion sort program that is not furnished with the package. Sort routines are necessary to get the items into the correct order for reports. Thus the user should have a sort utility, such as SuperSort



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(MicroPro) or QSort (Structured Systems) in order to effectively utilize the programs. The absence of a sort routine puts a bit of a burden on the user since, in the case of a novice, he must learn how to use a sort program as well as Analyst. A better approach would integrate the sort program into the Analyst menu, with the parameters for the sort included in the Analyst files, essentially transparent to the user.

Analyst is useful to implement a "data-base" application with a minimum of start-up time and trouble. It has certain advantages over other programs—but these are more a matter of programmer style rather than program deficiency. The missing elements in Analyst are, I think, in computational output (percentages/column summings) and perhaps in instructing the user how to implement "sorts" and ancillary programming. However, for a working set of programs that get the job done, Analyst stands out as a good buy.

Months ago, we carried out a review of the general ledger package offered by Structured Systems Group. Since then, a revision has been issued; here is an update.

Chaining capability added

In the first edition, no menu was used since the C-Basic language version under which it was written did not have the capability of "chaining" from one program to another. In the second release, this was corrected to correspond with the C-Basic-2 capability to chain. Thus Structured Systems general ledger now follows the industry standard of having a menu-driven system.

Otherwise it remains essentially the same and is one of the best on the market. The data entry sequence, in particular, is outstanding since it is rapid, and makes use of "special function keys" by using the 'escape' key followed by a number. So, for example, to repeat a field, the operator merely has to hit 'esc 1' and the field is repeated from the previous one.

One of its best features is the ease of set-up. Once the program and CP/M are on disk, it is a simple matter to set up a general ledger system. Parameters as to the format of the financials and headings are simply entered using a 'parameter entry' program. This is ideal for a CPA since each client can be set up on a different diskette.

Once data is entered, a neat journal entry sheet prints out. The system has no "bells and whistles." There's only one journal and it's readable. The only criticism is the omission of an individual date for each transaction; the system asks for a date at the beginning of data entry and that date is used for each journal entry until changed, which requires an exit to the menu.

Posting is rapid and efficient, and a trial balance can be printed out with all the beginning balances, the activity summary and an ending balance. From the standpoint of analysis, this is outstanding. Unlike Peachtree, for example, which provides no clue as to the balance of the accounts until the general ledger is run, Structured Systems allows the user to "preview" what all of the accounts will look like before running the detail or closing the books and running the financial statements.

General ledger program expanded

The newest addition to the GL programs allows the user to prepare a statement of changes in financial position—the so called "funds statement." Programs to prepare this statement have been few and far between—mostly because the statement is complex and requires input other than that which is normally a part of the general ledger files. The Structured Systems Group program is a valiant attempt to computerize the process.

If a funds statement is prepared on a monthly or quarterly basis, or is simple in nature, the program will save a lot of time and prevent all sorts of humanoid arithmetical errors. However, if the statement is only an infrequent report, manual methods (shudder) may be better. The program is complex, but well documented, and certainly a valuable adjunct to an outstanding set. □

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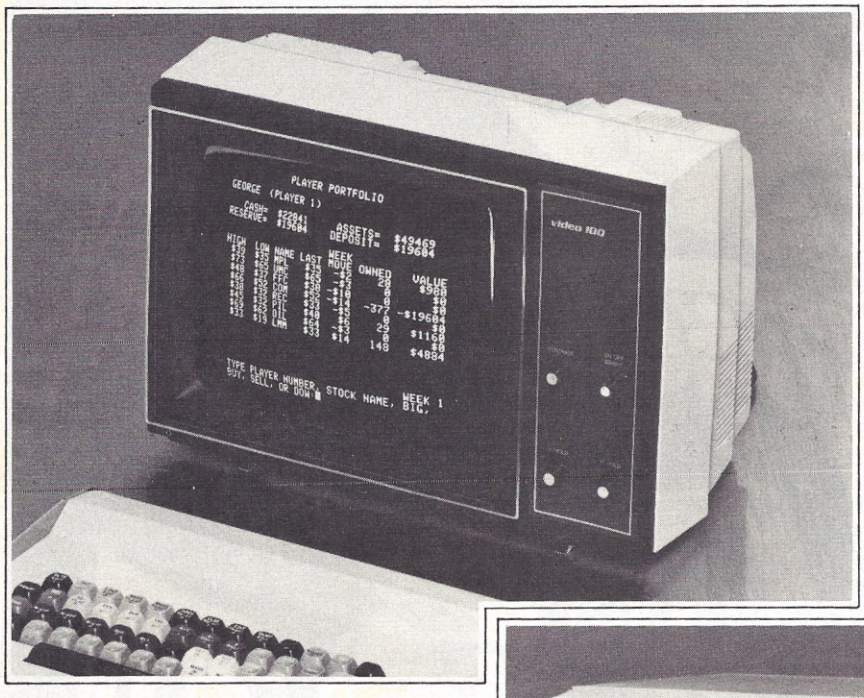

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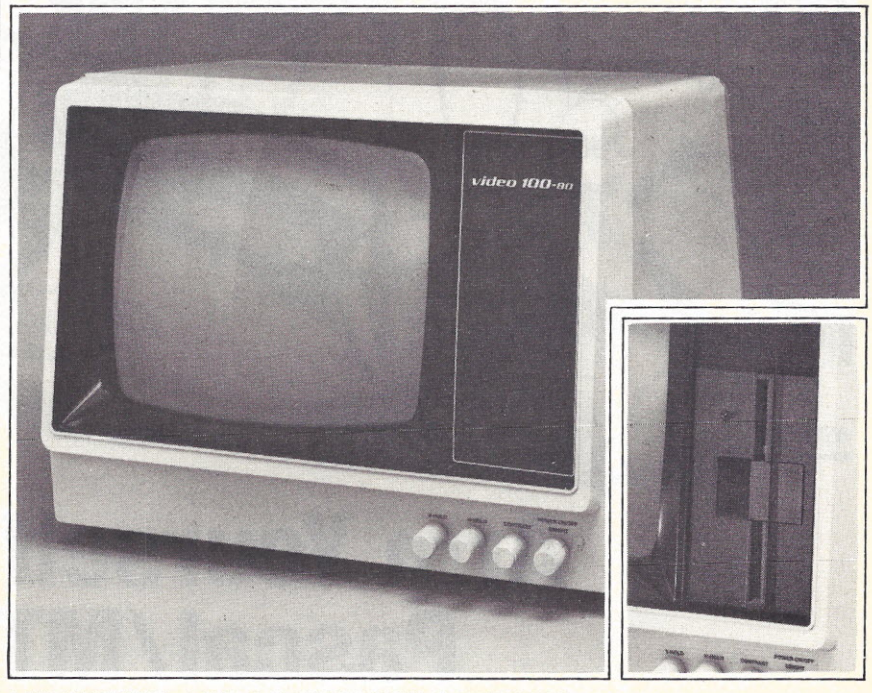

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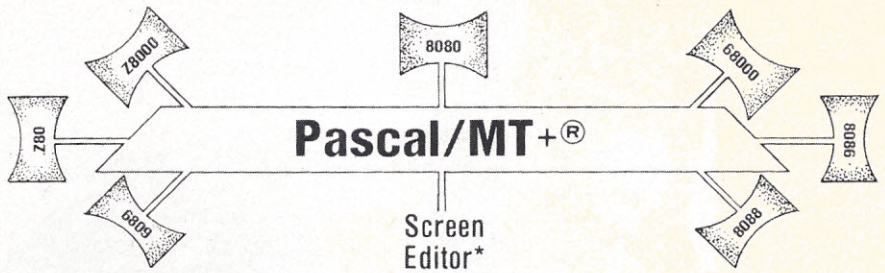

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System of the Month

Qantel 110

by Tom Fox

Is there ever a reason to throw out a computer program and start over? How about upgrading it to a new computer? Should you throw out an old, slow, expensive computer and replace it with a new, faster, cheaper one—even if it means starting over on the programs?

The answer to these questions is almost always the same: No. Moving to new hardware technology is hardly ever sufficient cause to throw out a working computer program.

How, then, do new computers get designed? The answer is simple: making sure that old software runs on the new hardware. We are thus introduced to the concept of "upward compatibility," wherein old programs run on newer (or larger) machines. The trick is tough and can involve design compromises that hobble the new hardware from operating at its most efficient.

In recent times, talk has shifted to "downward compatibility." The issue has surfaced due to competitive pressures. A present-technology $6,000 microcomputer has the potential to perform tasks possible with a $40,000 minicomputer designed a mere decade ago.

Nonetheless, the competition of cost is a worry to the manufacturers. A few have responded by introducing their own versions: IBM, with its ongoing 5100/5110/5120 experiment, is one example. More recently, the northern California manufacturer, Qantel Corp. (Hayward, CA), has taken the most ambitious step of all. It produced a desktop micro capable of running nearly all of its programs developed over the past 11 years. The cost differential is dramatic. At $15,990, a new Qantel 110 operates with the same programs as Qantel's middle-of-the-line system 900 costing over $50,000. The ambitious nature of the project is evident when you consider that the Qantel 110, with its 8-bit Z80 microprocessor, runs the same machine-level code as its 16-bit big brothers. This is a far more significant development than transporting a Basic program from one piece of equipment to another. It means, for one thing, that the new, smaller computer can (and does) utilize the same operating system software as its 16-bit predecessor.

Equally dramatic is the performance compromise suffered by the 110. It is, to be blunt, slow. Very slow. A Radio Shack TRS-80 model I, utilizing the same Z80 microprocessor is, at good guess, several times faster. Watching a Qantel 110 makes us rethink the blanket assumption that a computer must be dazzlingly quick because...well, because it *is* a computer.

But let's look at the plus side. Qantel has moved to a low-cost business computer without having to stumble

through the trauma of writing (or even adapting) programs for it. Presuming sufficient space exists on its floppy diskettes for the data base, the mature and reliable Inventory Control package (for example) developed for larger Qantel machines will work on the 110...and work well.

The most striking result of this carefully orchestrated software compatibility makes slipping into a larger and more capable processor nearly painless, due to the transportability of the programs. Upgrading is strained, however, by the limited expansion capabilities of the 110 itself. You must scrap nearly all of the Qantel 110 parts. Only the printer is usable with the larger machines, but even that is something less than appropriate for the faster equipment.

Varied software, expert manuals provided

A computer system, to be useful, must include several types of software. It should also include precision manuals so you can understand how to exploit the machine's capabilities, and knowledgeable people to install and service it.

Qantel Corp. is a publicly-held, $60-million company which has been in computers for over 11 years. It produces a range of business systems of which the 110 is the baby. Sales are through privately-owned distributors in every major U.S. city and 21 foreign countries. Its forte is the turnkey system—one that performs useful work for the customer from the day it is turned on.

Qantel's proudest achievement is its "Book of Solutions." Solutions is the name for a collection of application programs that will run on any Qantel machine. The programs reflect a long, long climb up Debug Hill. Just noting the number assigned to the most recent software release—level 32.0—speaks volumes to one familiar with the upgrading process.

Solutions includes nine separate packages: order processing, invoicing, inventory control, accounts receivable, sales analysis, general ledger, accounts payable, purchase orders and payroll. There is a generous interlinking among packages. For example, general ledger will incorporate data from the order processing, accounts receivable, accounts payable and payroll modules.

The Solutions programs are heavily parameterized—a tongue-twisting term that means they can be adapted to a customer's needs with little or no rewriting. An inch-thick installation manual walks your Qantel representative through the necessary steps.

It includes methods for file building, optional program feature activation, program initialization, and operator training. The effort is neatly organized by a special "installation generator" program, lending machine assistance to the task. Each program includes dummy data for demonstration and practice, so you can make the first round of mistakes on a fictitious company's data base—not yours.

The documentation is superb. The 14 manuals are almost equally divided between user guides and programmer references. Most software packages come equipped with a user's manual called System Description, as well as Technical Documentation, for the programmer who must understand or perhaps modify the package to suit a customer's tastes. Other manuals include Solutions Overview, Files Documentation, Installation Instructions and Demonstration Instructions. The library is so extensive that each volume contains a drawing of the 14 books with a "you are here" arrow—like the directory map in a shopping center.

Carried strongly through the Solutions manuals is the thread of a well-disciplined scheme for software configuration control. This is an aerospace term which deals with keeping on top of program updates, and watching over the compatibility between new program releases and old ones.

Solutions was written primarily in QICbasic, Qantel's only user-available language. Actually, the manufacturer would rather see you stick with its own Solutions (assuming you have appropriately matching Problems). On the subject of custom programs, Qantel's literature makes the cogent prediction that, "if the businessman who bought the computer can only communicate 70% of his needs, and if the programmer/analyst only comprehends 70% of what the businessman says, there is only a 49% chance that the completed system will exactly meet the businessman's requirements." Disturbing words, but true.

QICbasic is somewhat inaccurately named, as it shares little with the familiar Basics. It is intended for business applications only, so its list of 51 executable instructions excludes trigonometric capabilities (log, sin, cos, etc.). Precision for numeric variables can be up to 16 decimal digits. Both numeric and string arrays are allowed. Strings can be picked apart and put together, a feature well utilized in another of Qantel's programs, Word Processor.

QICbasic's strongest suit is its file-handling capability. Three types are allowed: sequential, keyed and contiguous. Record sizes for each can vary from one to 756 bytes, the size of a disk sector. Keyed files are the most used, and they put onto the operating system software the task of keeping random record entries automatically in alphabetical or numerical order. Only a single key (maximum 32 bytes) is allowed per data record.

In common with most other manufacturer's keyed file arrangements, the keys must be unique. One result is that such files are more appropriate for keeping track of part numbers than names, since only one "Smith" would be allowed.

Customized business reports possible

QICbasic is a semi-compiled language. As a result, it has the potential to run faster than a simple interpreter (as are most Basics). The execution speed is indeed impressive in the larger Qantel machines; not so on the 110.

Of all the Qantel-supplied programs, its Report Generator caught our eye as being the most attractive. Touted as "like English, only better," Report Generator allows you to design your own business reports from an established collection of data records.

Activate the Report Generator, and you are confronted with a detailed list of questions: which items to include, the sorted order for the report, etc. The program has the capability to total numeric columns and pick out data items based on a complex selection criteria. For example, you can order up a report of those vendors who have had price increases greater than 10% in the first year, and list them by zip code. The question-and-answer session can be quite lengthy; but once you have specified a report, the program

saves the parameters in a "dictionary file," which can be recalled directly the next time the need arises.

Databased Word Processor is Qantel's name for a highly structured and somewhat outdated text editor. The program incorporates rigid templates for a set of commonly encountered business documents, such as letters, interoffice memos and business proposals. The text is entered in fill-in-the-forms manner, producing such documents quickly.

Mailing lists may be merged with letter files, allowing individually-typed responses to customer inquiries. The problem is that the forms are somewhat inflexible, and you must adapt your business practices to conform. The text editing portion is line oriented, a legacy from an earlier generation. It is easily outclassed by many of today's crop of word processors. In common with other computers, full utilization of the Word Processor requires the purchase of an extra-cost letter-quality printer.

Power at your fingertips

Qantel's operating system is called Business Executive System for Time-sharing—BEST to its friends. It is a full-capability multi-user disk operating system, as powerful as most in the minicomputer world. BEST is somewhat under-utilized in the 110, however, as there is no way to connect more than one extra terminal due to hardware constraints. It is nice, though, to sit at the keyboard of a "tiny" computer like this and have at your fingertips the power of a mature and sophisticated collection of systems-level software.

The Qantel 110 is an all-in-one desktop unit appearing somewhat like a well-stuffed CRT terminal. Only the printer and expansion diskette drive, if fitted, require external housings. The plastic-enclosed main unit (containing display screen, diskette drives and processor electronics) is mounted on a solid aluminum pedestal in such a manner that it can be tilted up or down to fit the operator. The keyboard is detachable, with a generous leash to allow positioning to taste.

The basic 110 includes the processor, 48 kilobytes (characters) of memory and a dual 1.3-megabyte floppy diskette drive. The drive is a Persci 277 double-density, single-sided unit. The Qantel 120 is the identical machine fitted with a Persci 299 double-density, double-sided drive sporting twice the storage capacity. In either case, a second pair of diskette drives can be added later. Two drives (holding four diskettes) are the maximum expansion capability of the 110 or 120. Over five megabytes of storage, however, is a lot of data for a floppy diskette-based system.

An additional 16 kilobytes of RAM can be fitted, bringing the total to 64 kilobytes. Also in the memory department is an unspecified but large allocation of ROM, which contains the program to translate Qantel machine language instructions into Z80 code. The original Qantel processors were wired up with random transistor-transistor logic chips; more recently, the processor has been implemented with 16-bits' worth of 2900-bit slice devices.

The ROM in the 110 has the unenviable burden of interpreting each Qantel-format machine instruction into one or several (or many) Z80 instructions as it arrives. This, we suspect, is the main reason for the lackadaisical manner in which the 110 attacks its computations.

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The Z80 is operating as fast as it can, but it's like running up a sand dune: the yards passing underfoot are far in excess of the distance actually covered.

Inside the 110's main enclosure, we find a seven-slot card cage containing a variety of 8-inch by 12-inch circuit cards. It comes as no surprise to learn that the electrical and mechanical specifications for the cards do not conform to any common standard in the micro world, but are of Qantel's own invention. The cards include the CPU, memory and diskette drive controller. Enough space remains for a printer controller and additional CRT controller card, bringing the 110 up to its maximum capacity of two users. The cards that interface with external devices (diskette drive, printer, second CRT) contain their own Z80 microprocessor to take some of the load off the main number cruncher.

The CRT display is of the memory-mapped type, and includes such advanced functions as character and line insertion. In practice, the terminal runs in the "block" mode. This mode requires the user to place data onto the screen via the keyboard, then press a 'transmit' key in order to send it to the CPU. The screen has

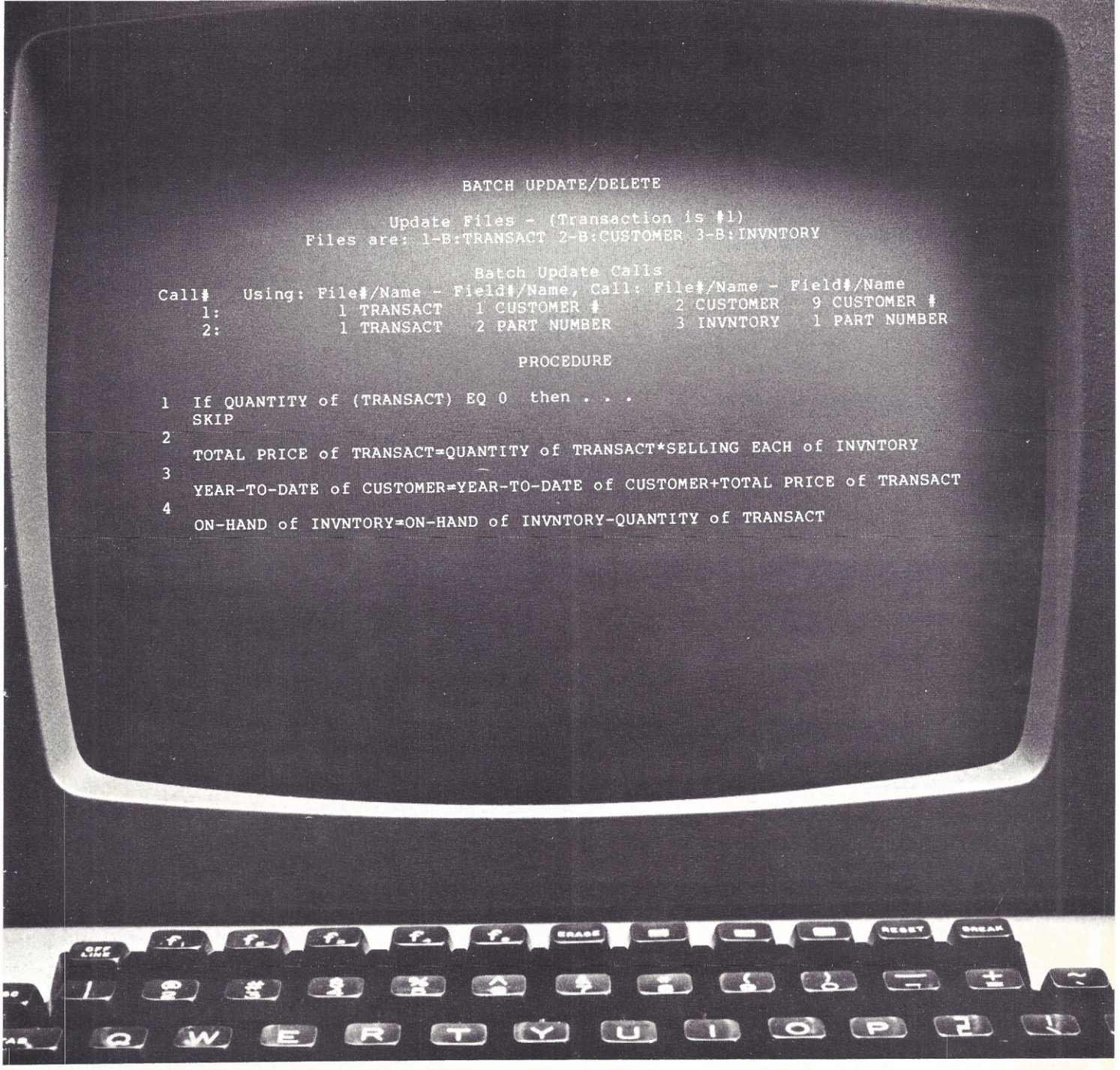
Electrical and mechanical specifications...are of Qantel's own invention.

selective reverse video, a capability almost over-used in the Results applications programs. Typical business screen displays tend to look like mid-game in a Breakout session.

The preferred printer is one manufactured by Qantel. It comes in a handsome housing, and is a relatively quiet, serial dot-matrix design. Printing speed is 150 characters-per-second; automatic forward and backward printing is standard. The 55-cps Nippon Electric Spinwriter is the optional typewriter-quality device; a teletype model 40 300-lines-per-minute line printer is also available.

An unadorned Qantel 110, complete with 48 kilobytes of memory and dual single-sided diskette drive, lists for $11,950. The sister 120, with a twice-the-disk capacity, is $2,500 more. Add-on sets of dual diskette drives can be purchased for $4,950 or $5,950, respectively. An additional 16 kilobytes of memory, bringing the system up to its maximum capacity of 64 kilobytes, lists for $1,450. The 150-cps dot matrix printer will cost $3,950, and a second CRT terminal is available for $3,450. Both prices include the necessary controller cards which plug into waiting slots in the 110's card cage.

The prices include the BEST operating system, Report Generator, Databased Word Processor, QIC-basic language and a clutch of utility programs intended to make the programmer's life a bit easier. The Results applications programs are priced separately, and will vary depending upon your requirements for customizations. □



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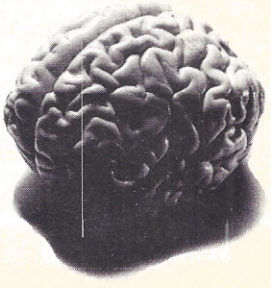

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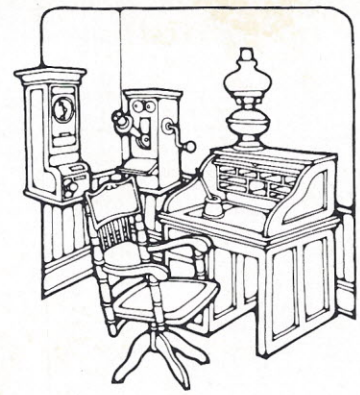

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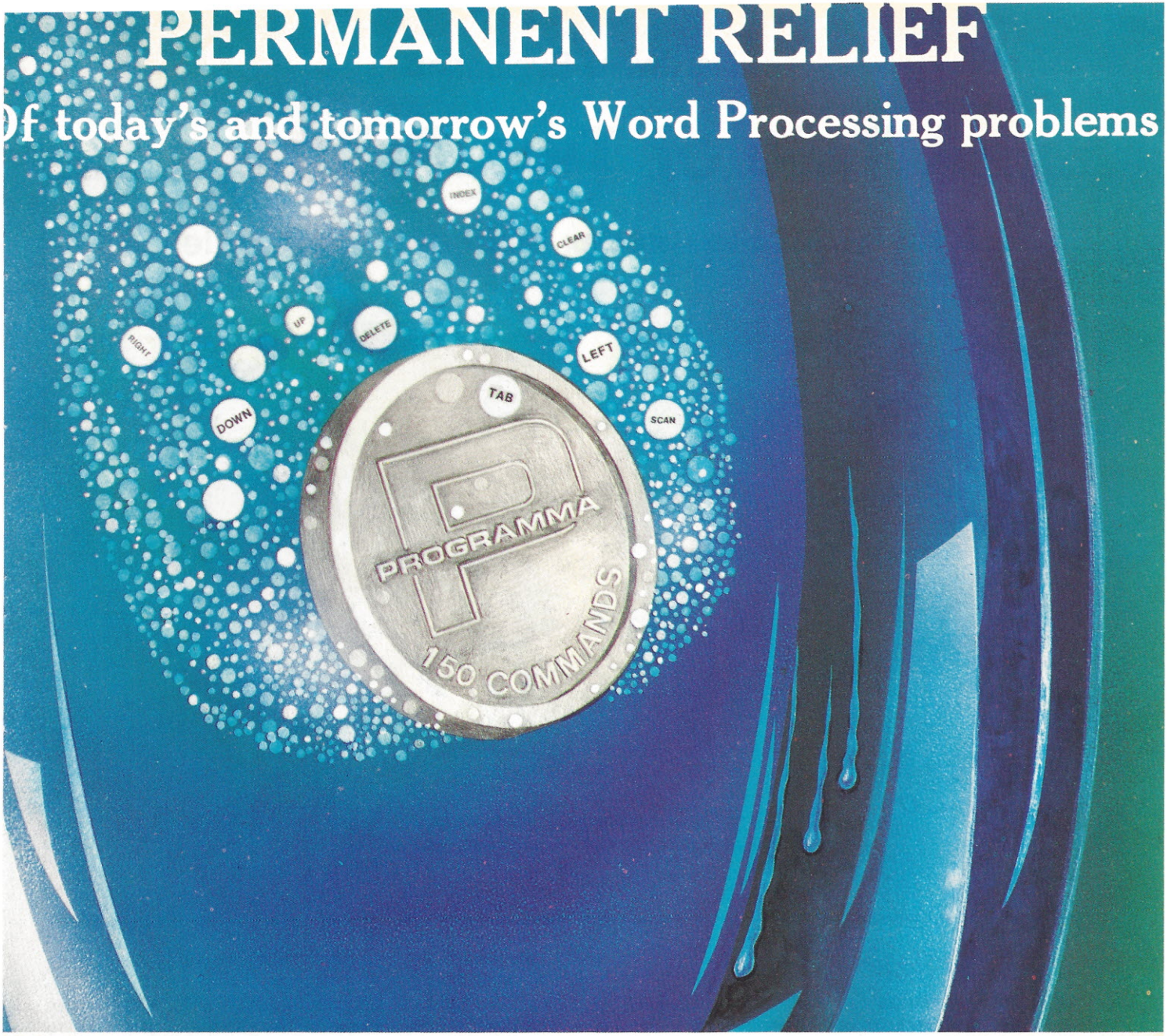

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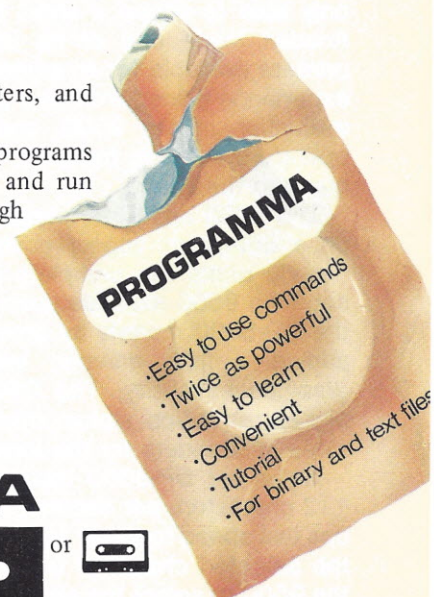

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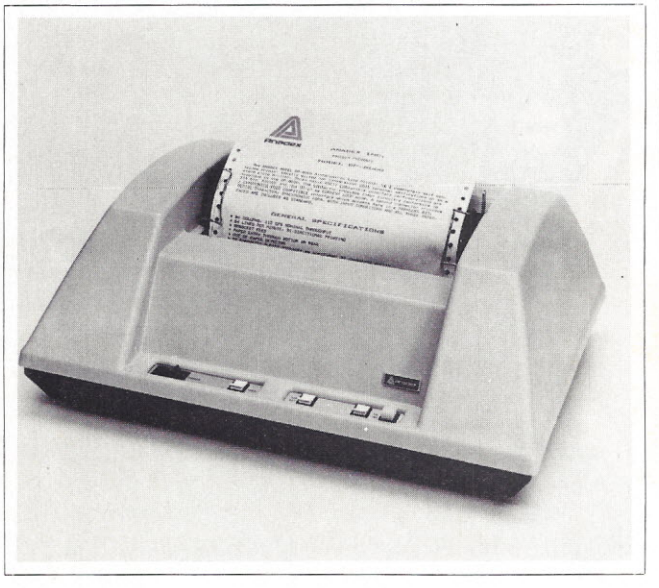
A Tale of Two Printers

A review of the Anadex 8000 and 9500 series



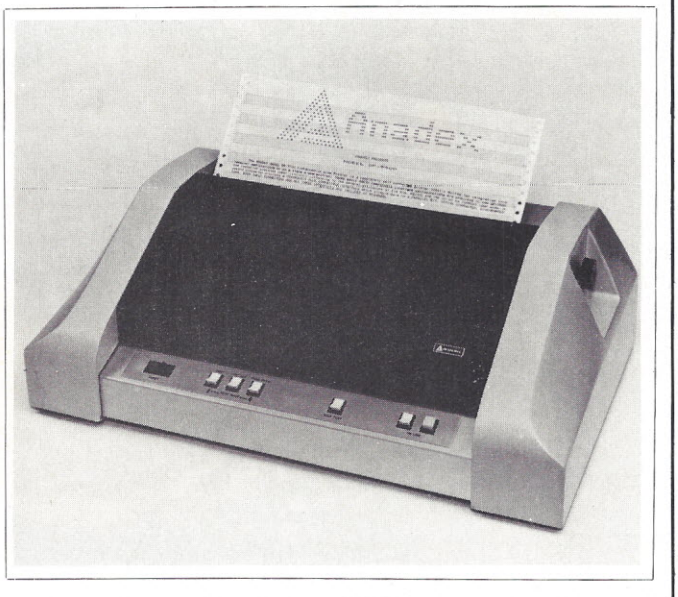


Figure 1: The series 8000 and 9500 printers are both based on dot-matrix impact, bidirectional printing heads.

by Roger H. Edelson

This article intended to review the Anadex 9500 series graphic alphanumeric printers. Due to the pressure of scheduling shipments of this model, I was only able to spend a short time with the 9500, but Anadex made one of its late model DP-8000 line printers available for an extended evaluation. With the experience gained from use of the DP-8000, my short evaluation of the 9500, and the liberal use of the operators manuals for both, it seemed worthwhile to broaden the scope.

The 8000 and 9500 series printers are both based on a dot-matrix impact printing head which bidirectionally prints the complete 96-character Ascii code set. The 9500 expands upon the 7-wire head used in the DP-8000 models by providing a 9-wire head and adding a high density, individual dot-addressable graphics capability. The 9500 printers also have a higher resolution alphanumeric print font which provides descenders for the lower-case characters.

While the DP-8000 models print at a respectable 112 characters per second, the DP-9500/9501 series ups this speed to either 150 or 200 CPS, depending on the selected character font. The inclusion of logic in the 9500 to select the shortest distance between successive print locations probably accounts for this increased throughput.

Both printers provide an adjustable width paper feed—3 to 9½ inches for the DP-8000, and 1.75 to 15.6 inches for the 9500. The paper feeds are noticeably different, however. The DP-8000 models use a solenoid and ratchet technique while the more advanced (and more expensive) DP-9500/9501 printers use a true tractor feed. The solenoid and ratchet technique gets the job done, but it is considerably noisier.

I am not a big fan of the lever which allows manual feed of the paper. You have the feeling that the lever should be pushed forward to advance the paper rather than pulled backward and released. This design also, unfortunately, does not allow the paper to be moved backward. The 9500 printers use a true stepper motor to drive the paper advance mechanism allowing accurate paper positioning in 0.014-inch increments. Manual feed on the 9500 models is bidirectional in 0.056-inch increments, and the printer can print from 132 columns to 220 columns depending on the selected chararacter font.

The 9500 printers continue the Anadex practice, begun with the later model DP-8000 printers, of implementing the three basic I/O configurations. Both printers provide input circuitry which will accept either

SPECIFICATION	DP-8000	DP-8000-AP	DP-9500	DP-9501
Columns	80	80	132/158/176	132/165/198/220
Characters-per-second	112	134	150/180/200	120/150/180/200
Character font	9 x 7	7 x 7	9 x 9/7 x 9/7 x 9	11 x 9/7 x 9/7 x 9/7 x 9
Double width printing	Yes	Yes	Yes	Yes
Printhead life	100M characters	100M characters	650M characters	650M characters
Lines-per-minute	84	84	50 to 200 +	50 to 200 +
Paper feed	Sprocket	Sprocket	Tractor	Tractor
Paper width	3 in. to 9.5 in.	3 in. to 9.5 in.	1.75 in. to 15.6 in.	1.75 in. to 15.6 in.
Line spacing	6 per in.	6 per in.	6/8 per in.	6/8 per in.
Paper entry	Bottom/rear	Bottom/rear	Bottom/rear	Bottom/rear
Out-of-paper detector	Yes	Yes	Yes	Yes
Number of copies	3	3	5	5
Self-test	Yes	Yes	Yes	Yes
Physical	18.6W x 14.2D x 7.3H	18.6W x 14.2D x 7.3H	26.63W x 15.43D x 8.29H	26.63W x 15.43D x 8.29H
Weight	20 lbs.	20 lbs.	35 lbs.	35 lbs.
Interface	All support RS-232C, 20/60 ma current loop, Centronics-parallel			

Table 1: Comparison of printer characteristics.

EIA STD. RS232C signals, 20/60 ma. current loop inputs, or a Centronics plug-compatible, parallel-bit, serial-character interface. This kind of attention to user operational enhancement has remained a hallmark of the Anadex designs.

To keep up with data bursts, both series of printers provide approximately 1K of character storage in a 'fifo' register. This temporary memory can be increased to over 2K bytes for terminal dump applications. Anadex also strongly recommends that the 2K byte storage be added to the 9500 series models if the graphics capability is to be used. If this expanded 'fifo' buffer has not been installed, then the graphics protocol given by Anadex must be followed exactly or it is possible to "lock up" the printer such that no further copy can be produced.

This lock-up condition will occur if there are more than 600 bytes of graphics in each graphic block such that the standard character buffer will overflow; in this case, on/off cycling of the printer power is necessary to restore printer operation. Luckily, the protocol given by Anadex is not difficult to adhere to, and only results in a slight loss of throughput.

One operational problem that will be encountered in the 9500, no matter how much buffer exists, is that there is no form length while in the graphics mode. Therefore, the top-of-form and form length must be re-established after exiting the graphics mode.

The Anadex 8000 printers provide top-of-form control, skip-over-perforation control, vertical tab, double-width printing, and self-test. The 9500 provides enhancements to all of these features plus full com-

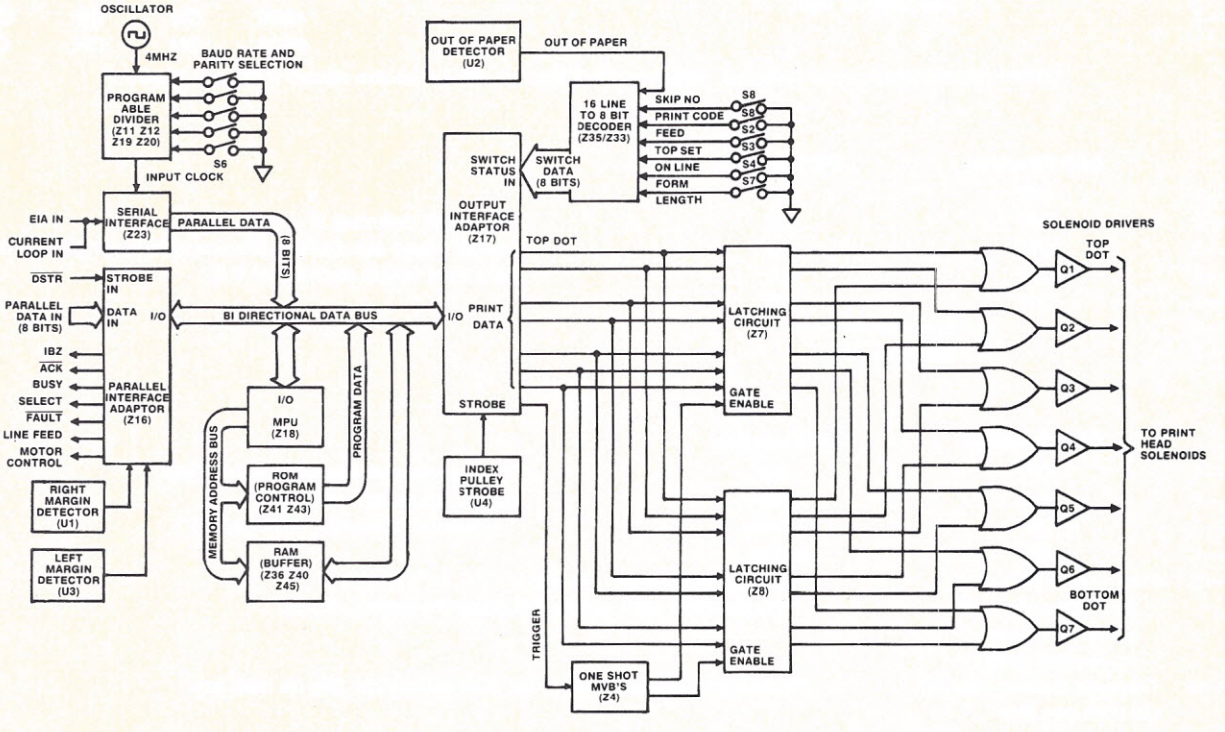


Figure 2: DP-8000 printer, functional block diagram.

munication control and normal/compressed character font selection. Maximum throughput for each series printer is approximately 1 to 1.4 lines-per-second.

Table 1 lists the features and characteristics of each of the two printer series. Note that Anadex now manufactures a model DP-8000-AP printer which is compatible with, and tailored specifically for, the Apple business system.

The functional block diagram of the DP-8000 printer is presented in figure 2. The controller is based upon a bidirectional bus supported by a Motorola Mc6802 microprocessor. The 4K of ROM and 1K of RAM constitute standard memory and, as mentioned earlier, the RAM may be optionally expanded by another 2K.

Additional support integrated circuits from the Motorola 6800 line are used as the serial, parallel, and output interface adapters. The controller system functions as a firmware-based microprocessor in which the CPU initiates all action depending on the data and the control inputs. These inputs include the incoming data, operator switch settings, error conditions, and the print head/paper position information. The microprocessor, in conjunction with the character font information stored in ROM, generates all the print signals to the seven print solenoids.

Two Octal Dflip/flops are used in the unique output latch circuitry. This allows the printer to generate

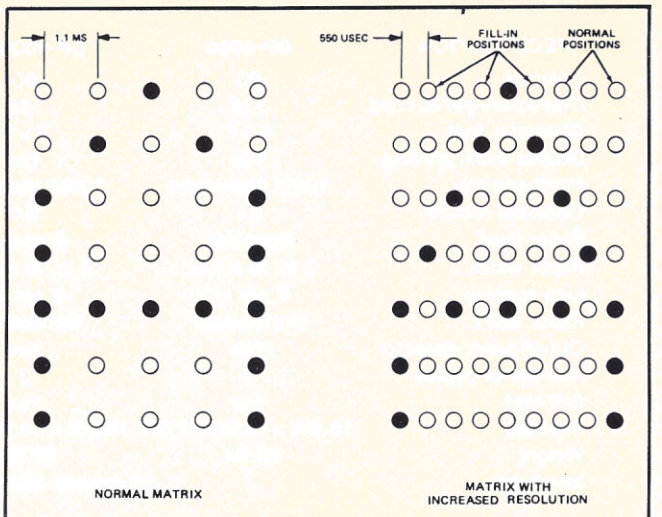


Figure 3: Print-dot matrix

characters with an increased horizontal resolution—a sort of pseudo 10 x 7 dot matrix. The printer horizontal resolution is determined by the print-head transversing speed and the rate at which the print wire/solenoids can be recycled—normally 1.1 msec.

With this double-latch design, and a 550-usec. strobe, the fill-in positions between the normal matrix

S6

	OFF Function	ON Function
—1	Serial Interfaces	Parallel Interface*
—2	RS-232-C Interface	Current Loop Interface
—3	Ignore Parity	Check Parity (Serial Int. only)
—4	Odd Parity	Even Parity
—5	Baud rate selection	
—6	See table at right	
—7		

Baud Rate	—5	—6	—7
110	OFF	OFF	OFF
150	OFF	OFF	ON
300	OFF	ON	OFF
600	OFF	ON	ON
1200	ON	OFF	OFF
2400	ON	OFF	ON
4800	ON	ON	OFF
9600	ON	ON	ON

*When parallel interface is selected, switches S6-3 through S6-7 must be placed in the off position.

S7

	OFF Function	ON Function
—1	OFF	0.5"
—2	OFF	1.0"
—3	OFF	2.0"
—4	OFF	4.0"
—5	OFF	8.0"
—6	------Spare Switch------	
—7	------Spare Switch------	

For length switches in inches.
Switch values are additive (maximum form length: 15.5")
Zero form length defaults of 0.5".

S8

	OFF Function	ON Function
—1	OFF	1 line
—2	OFF	2 lines
—3	OFF	4 lines
—4	OFF	8 lines
—5	Print only on CR code (multiple-code print-action and paper-movement mode).	Print and move paper on CR, LF, FF, or VT code (Single-code print-action and paper-movement mode).
—6	Truncate excess over 80 columns per line.	Wraparound—print excess over 80 columns per line on next line.
—7	------Spare Switch------	

Skip-over-perforation distance in lines.
Switch values are additive
(maximum distance: 15 lines/2.5").

Table 2: Switch functions

The first personal computer for under $200.

The Sinclair ZX80. A complete computer—only $199.95 *plus $5.00 shipping.*

Now, for just $199.95, you can get a complete, powerful, full-function computer, matching or surpassing other personal computers costing several times more.

It's the Sinclair ZX80, the computer that independent tests prove is faster than all previous personal computers. The computer that "Personal Computer World" gave 5 stars for 'excellent value.'

The ZX80 cuts away computer jargon and mystique. It takes you straight into BASIC, the most common, easy-to-use computer language.

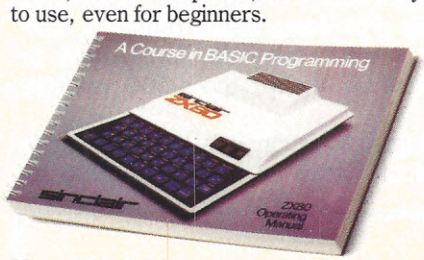
You simply take it out of the box, connect it to your TV, and turn it on. And if you want, you can use an ordinary cassette recorder to store programs. With the manual in your hand, you'll be running programs in an hour. Within a week, you'll be writing complex programs with confidence.

All for under $200.

Sophisticated design makes the ZX80 easy to learn, easy to use.

We've packed the conventional computer onto fewer, more powerful LSI chips—including the Z80A microprocessor, the faster version of the famous Z80. This makes the ZX80 the world's first truly portable computer (6½" x 8½" x 1½" and a mere 12 oz.). The ZX80 also features a touch sensitive, wipe-clean keyboard and a 32-character by 24-line display.

Yet, with all this power, the ZX80 is easy to use, even for beginners.



Your course in computing.

The ZX80 comes complete with its own 128-page guide to computing. The manual is perfect for both novice and expert. For every chapter of theory, there's a chapter of practice. So you learn by doing—not just by reading. It makes learning easy, exciting and enjoyable.

The ZX80's advanced design features.

Sinclair's 4K integer BASIC has performance features you'd expect only on much larger and more expensive computers. These include:

- Unique 'one touch' entry. Key words (RUN, PRINT, LIST, etc.) have their own single-key entry and are stored as a single character to reduce typing and save memory space.
- Automatic error detection. A cursor identifies errors immediately to prevent entering programs with faults.
- Powerful text editing facilities.
- Also programmable in machine code.
- Excellent string handling capability—up to 26 string variables of any length.
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- Built-in random number generator for games and simulations.

Sinclair's BASIC places no arbitrary restrictions on you—with many other flexible features, such as variable names of any length.

And the computer that can do so much for you now will do even more in the future. Options will include expansion of 1K user memory to 16K, a plug-in 8K floating-point BASIC chip, applications software, and other peripherals.

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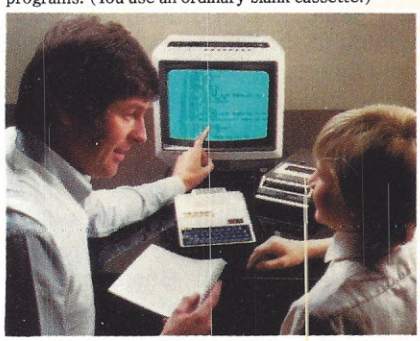
The ZX80 is available only by mail from Sinclair, a leading manufacturer of consumer electronics worldwide. We've already sold tens of thousands of units in Europe, so demand will be great.

To order by mail, use the coupon below. But for fastest delivery, order by phone and charge to your Master Charge or VISA. The ZX80 is backed by a 30-day money-back guarantee, a 90-day limited warranty with a national service-by-mail facility, and extended service contracts are available for a minimal charge.

Price includes TV and cassette connectors, AC adaptor, and 128-page manual.

All you need to use your ZX80 is a standard TV (color or black and white). The ZX80 comes complete with connectors that easily hook up to the antenna terminals of your TV. Also included is a connector for a portable cassette recorder, if you choose to store programs. (You use an ordinary blank cassette.)



The ZX80 is a family learning aid. Children 10 and above will quickly understand the principles of computing—and have fun learning.

Phone orders only: (203) 265-9171. We'll refund the cost of your call.
Information: General and technical—(617) 367-1988, 367-1909, 367-1898, 367-2555. Phones open Monday-Friday from 8 AM to 8 PM EST.

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Sinclair Research Ltd., 475 Main St., P.O. Box 3027, Wallingford, CT 06492.

To: **Sinclair Research Ltd., 475 Main St., P.O. Box 3027, Wallingford, CT 06492.**
Please send me _____ ZX80 personal computer(s) at $199.95* each (US dollars), plus $5 shipping. (Your ZX80 may be tax deductible.)
I enclose a check/money order payable to Sinclair Research Ltd. for $_____.

Name _____

Address _____

City _____ State _____ Zip _____

Occupation: _____ Age: _____

Intended use of ZX80: _____

Have you ever used a computer? ☐ Yes ☐ No.
Do you own another personal computer? ☐ Yes ☐ No. *For Conn. deliveries, add sales tax.

IA-12-0

```
ROMS CRCC MATCH, RAM ERROR=0000
01000000 11101000
VERTICAL TABS SET=
HORIZONTAL TABS SET=
FIFO=02C0H BYTES; LNG=00H LINES; WDTH=84H x 0.1 INCH
AUTO-LF OFF; COMM.= PARALLEL MODE; SKIP @ LINE 00H
!"#$%&'()*+,-./0123456789:;<=>?@ABCDEFGHIJKLMNOPQRSTUVWXYZ[\]^_`abcdefghijklmnopqrstuvwxyz{|}~
```

Figure 4: DP-8000 self-test printout

dot positions can be used; the basic 1.1-msec. recycle time for each print wire cannot be exceeded. Figure 3 shows the normal and the increased resolution print-dot matrices.

The DP-8000 I received came packaged in one of those foamed-in-place plastic cocoons. It is a huge box for a table-sized printer measuring 18½ × 14 × 7 inches; but it should certainly do a good job of protecting the printer during transit.

After removing the printer from this enfolding foam womb, the owner is met with a large warning card containing instructions on which additional pieces of foam and tape must be removed in order to render his new baby operational. It is nice to have all this protection after having previous experience with the havoc which can be wreaked by the various freight delivery companies.

Self-test start up

Before actual operation of the printer can begin, the user selectable operating features must be set up according to the functions shown in table 2. Note that the form length adjustment obtained by setting S7 is additive and binary in representation with a resolution of 0.5 inch per bit and a maximum length of 15.5 inches (all "1's").

After all the appropriate functions were set, paper was loaded and the self-test switch (S5) energized. A sample self-test printout with function indentification is shown in figure 4. Besides testing the operational capability of the printer, the self-test listing of the various operating modes which were selected prior to initialization is extremely helpful.

At this point, an EIA RS232-style connecting cable was liberated and the DP-8000 and my NorthStar Horizon were interconnected. I used CP/M to bring up its text editor and was immediately able to produce hard copy—as easy as that. To drive the printer, I used the right serial port as that is the one that is implemented for a printer on my Horizon.

Once the printer is interconnected and operating, it is a simple matter to get the page to the location of top-of-form, though I would rather have a paper advance knob rather than the ratchet lever to advance the pin-feed system. The model 9500/9501 provides this feature along with the somewhat sturdier full tractor-feed mechanism. With the paper adjusted for top-of-form, the form length function set for my desired page length, and the perforation skip control adjusted as desired, forms printing is quite reliable.

The printer moves merrily along, correctly skipping each paper perforation as it reaches the end-of-page location. While skipping the perforated area, the printer stores the incoming characters in the 'fifo' and then reads them out as it catches up later.

Of course, if you are going to send a continuous stream of data, the baud rate has to be set low enough so that the printer can keep up, otherwise the buffer will finally overflow. A sample of the printing capability of the printer illustrating both upper- and lower-case characters as well as double-width printing is shown in figure 5.

The Anadex DP-8000 and its apple-polishing cousin, the DP-8000-AP, should serve the general user quite well and quite reliably. For those users requiring considerable hard copy printout, full-width forms, four to five copies, or a graphics mode, the 9500 printers should be selected.

The DP-9500 models interconnect with a microcomputer installation as easily as does the 8000 as

```
ABCDEFGHIJKLMNOPQRSTUVWXYZ0123456789:;<=>?@[\]^_
abcdefghijklmnopqrstuvwxyz{|}~ !"#$%&'()*+,-./`

THE DP-8000 IS THE PRICE/PERFORMANCE PRINTER. YOU HAVE JUST WITNESSED THE
HIGH PERFORMANCE. NOW ASK FOR OUR LOW PRICE.

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REPRESENTATIVE. GET YOURS TODAY.

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```

Figure 5: DP-8000 print sample

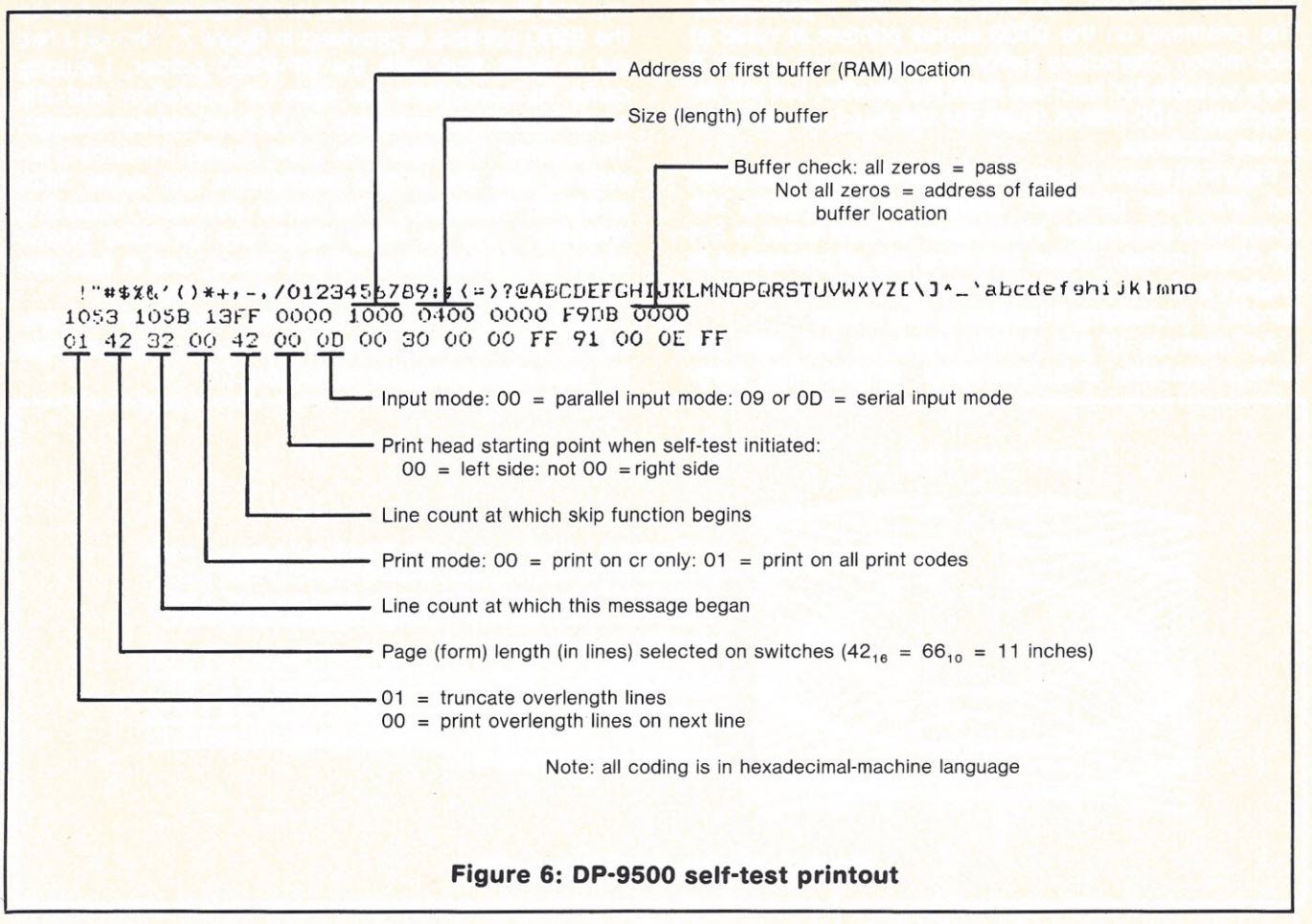

Figure 6: DP-9500 self-test printout

the three standard I/O interfaces are implemented. The printhead on the 9500 series printers is rated at 650 million characters before failure, which makes it more suitable for hard use than the smaller, but still respectable, 100 million figure for the head on the 8000 series machines.

Figure 6 shows a copy of the sample self-test printout from the DP-9500. Instead of hex-coding the operational parameter information as was done in the DP-8000 models, these functions are all presented in English and are much easier to interpret; an obvious benefit of increasing intelligence in a printer.

An example of the entire character set with the various available character fonts, double-width printing, and illustrative graphics which can be produced by the 9500 printers is provided in figure 7. Though I had but a short time with the DP-9500 printer, I quickly came to appreciate its ease of operation and the amount of control available to the host microprocessor. Throughout the test the print quality remained excellent, and the printer mechanism and paper feed operated flawlessly. The same comment regarding reliability can be made about the DP-8000 printer which is still operating without failure, and in fact was used to prepare the draft copy of this review.

Depending on your personal hard-copy requirements, one of these Anadex printers may be just right for your microcomputer installation. □

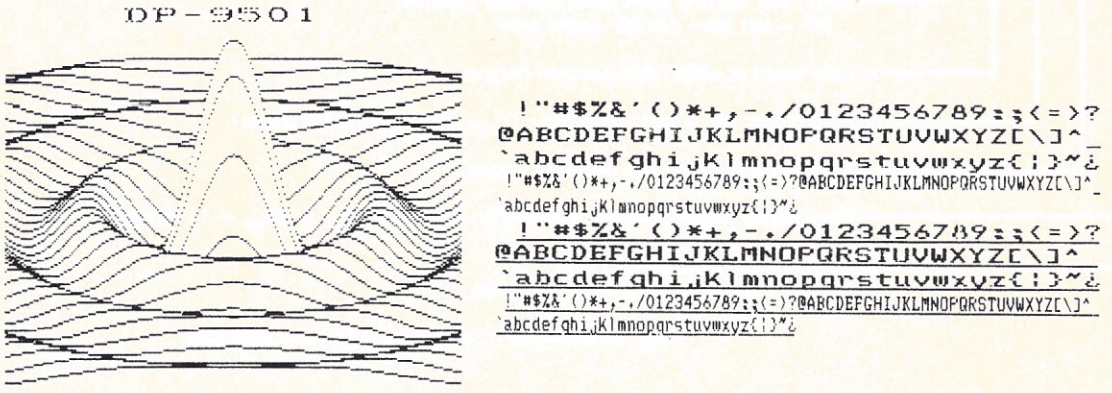

Figure 7. Sample printout from 9501.

The Perfect Fit

The Micromodem II data communications system and the Apple II* computer. What better combination to maximize the capabilities of your personal computer!

This popular direct connect modem can transmit data between an Apple II and another Apple II, a terminal, another microcomputer, minicomputer or even a large time-sharing computer anywhere in North America. The Micromodem II has unique automatic dialing and answer capabilities which further increases the communications possibilities between the Apple II and another computer or terminal.

You can send and/or receive messages or data when you are out of your office, home or out of town. Your branch business locations can communicate with each other regarding inventory and other matters over the phone. Or you can communicate with friends across the country. And you can access information utilities like the SOURCE for various business and personal applications.

The Micromodem II consists of two parts. One part includes the printed circuit board which holds the Micromodem II, ROM firmware and the serial interface. The board plugs directly into the Apple II providing all the functions of a serial interface card plus programmable auto dialing and auto answer capabilities. The on-board ROM firmware enables the Micromodem II to operate in any of three modes to perform different tasks-terminal mode, remote console and program control mode.

The other part of the Micromodem II datacomm system is a Microcoupler which connects the Micromodem board and Apple II to a telephone line. The Microcoupler gets a dial tone, dials numbers, answers the phone and hangs up when a transmission is over. There are none of the losses or distortions associated with acoustic couplers. The Microcoupler is compatible with any North American standard telephone lines and is FCC-approved for direct connection in the U.S. It works with standard dial phone service or Touch-tone service.

The Micromodem II is completely compatible with Bell 103-type modems. Full and half-duplex operating modes are available as well as speed selectable transmission rates of 110 and 300 bps.

Why not increase your Apple II's capabilities by outfitting it with the sophisticated Micromodem II data communications system? The Micromodem II is available at retail computer stores nationwide. For the store nearest you, call or write:

CIRCLE INQUIRY NO. 29

Hayes™

Hayes Microcomputer Products Inc.
5835 Peachtree Corners East, Norcross, Georgia 30092 (404) 449-8791

™ Micromodem II is a trademark of Hayes Microcomputer Products, Inc.
*Apple II is a registered trademark of Apple Computer Inc.
The Micromodem II can also be used with the Bell & Howell computer.

$ Free Literature

Data communications. A 16-page booklet, "We're Judged by the Company You Keep," describes several communication applications in which OEMs have installed systems in the fields of manufacturing, chemicals, international affairs, drugs, food distribution, law enforcement, and securities. Request publication #012-855. Communications Services, Data General Corp., 4400 Computer Dr., Westboro, MA 01580.

CIRCLE INQUIRY NO. 200

Computer graphics. A 12-page booklet describes the uses of interactive computer graphics display systems in control applications. The booklet discusses the significant role of computer graphics systems in converting digital data into real world terms for the industrial process operator or military command and control expert. Corporate Communications, Ramtek Corp., 2211 Lawson Lane, Santa Clara, CA 95050, (408) 988-2211.

CIRCLE INQUIRY NO. 201

Switch equipment. A 32-page catalog includes photos, line drawings, specifications, and ordering information on complete line of miniature and subminiature switches. Catalog #8007. Chicago Switch, Inc., 1714 N. Damen Ave., Chicago, IL 60647, (312) 489-5500.

CIRCLE INQUIRY NO. 202

Business system. A one-page brochure details the series 4000 microcomputer system, using a 16-bit microprocessor with private memory bus. The unit is a single desktop configuration with a rack mounting option available. Mercator Business Systems, 2378A Walsh Ave., Santa Clara, CA 95051, (408) 496-0424.

CIRCLE INQUIRY NO. 203

Data systems listed. A quarterly newsletter, Transcommunique, contains information on products, services, and technical advances of Transcomm Data Systems. A subscription to the newsletter is available for interested clients. Marketing Dept., Transcomm Data Systems, 1380 Old Freeport Rd., Pittsburgh, PA 15238, (412) 936-6770.

CIRCLE INQUIRY NO. 204

Computer shielding products. A 4-page bulletin provides data and specifications on a range of products for EMI/RFI shielding for computers, as well as protectants against static discharge. Bulletin #ESG-803. Metex Corp., Electronic Products Div., 970 New Durham Rd., Edison, NY 08817.

CIRCLE INQUIRY NO. 205

Power supplies. Catalog details the Mil-Qual line of encapsulated and open frame power supplies including military and harsh environment equipment, AC/DC regulators, switchers in open construction and/or fully or partially encapsulated formats, accessories, plus discussions of over voltage protection, rack mounts, thermal data for base rated models. Technipower, Inc., Box 222, Commerce Park, Danbury, CT 06810, (203) 748-7001.

CIRCLE INQUIRY NO. 206

Network communications. Brochure describes products for local data networks, including limited distance modems, line drivers, coaxial cable modems, microwave modems, FM systems and random access carrier current modems. Data-Control Systems, Box 860, Commerce Dr., Danbury, CT 06810, (203) 743-9241.

CIRCLE INQUIRY NO. 207

S9900 article reprints. Reprints of technical articles on the S9900 16-bit microprocessor include engineering notes on applications of the device, interfacing it to other circuits and a comparison of its performance with other 16-bit processors. Claudia Willrodt, American Microsystems, Inc., 3800 Homestead Rd., Santa Clara, CA 95051, (408) 246-0330, ext. 457.

CIRCLE INQUIRY NO. 208

Terminal enhancement. Brochure describes the Commander series of 500 and 900 desktop computers, which include a 5-inch or 9-inch video display and keyboard with 128 Ascii characters and 128 unique function codes. Also included are MX and FX terminal enhancement computers that may be combined with any RS-232 compatible keyboard/display terminal to provide a similar system. Business Marketing, Inc., 2012 W. St., Annapolis, MD 21401, (301) 266-0550.

CIRCLE INQUIRY NO. 209

Heat shrinkable products. A 32-page catalog introduces several major product additions to a line of heat shrinkable tubings. A technical data section is also included. Ramtek, 3073 N. 1st St., San Jose, CA 95134, (408) 946-8400.

CIRCLE INQUIRY NO. 210

Educational booklet. A pamphlet, "The Small Business Computer I.Q. Quiz" is designed to discuss in nontechnical language the issues confronting the first-time business system user. Alpha Micro, Box 18347, Irvine, CA 92713, (714) 957-1404.

CIRCLE INQUIRY NO. 211

Electronics equipment. A 104-page catalog features nearly 400 build-it-yourself kits in amateur radio, microcomputers, test equipment, audio, automotive, and television. Also included are computer software and self-instructional educational courses including Cobol language programming, microprocessors, and electronics for the hobbyist. Heath Co., 1480 Dundas Highway E., Mississauga, Ontario L4X 2R7.

CIRCLE INQUIRY NO. 212

Connector equipment. A 20-page design guide, Creative Technology in Back Plane Systems, includes technical data on a variety of printed circuit, metal and SEM/NAFI panels and connectors. Catalog #C-164. Marketing Services, TRW Cinch Connectors, 1501 Morse Ave., Elk Grove Village, IL 60007.

CIRCLE INQUIRY NO. 213

Purchasing a system. A booklet, "A Strategy for Buying a Small Business Computer," provides the small business executive with discussions of management considerations in picking a computer. Media Response Mgr., Digital Equipment Corp., 129 Parker St., Maynard, MA 01754.

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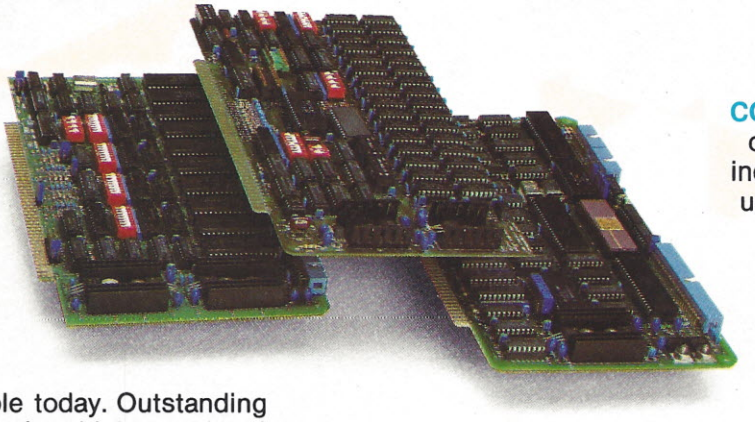

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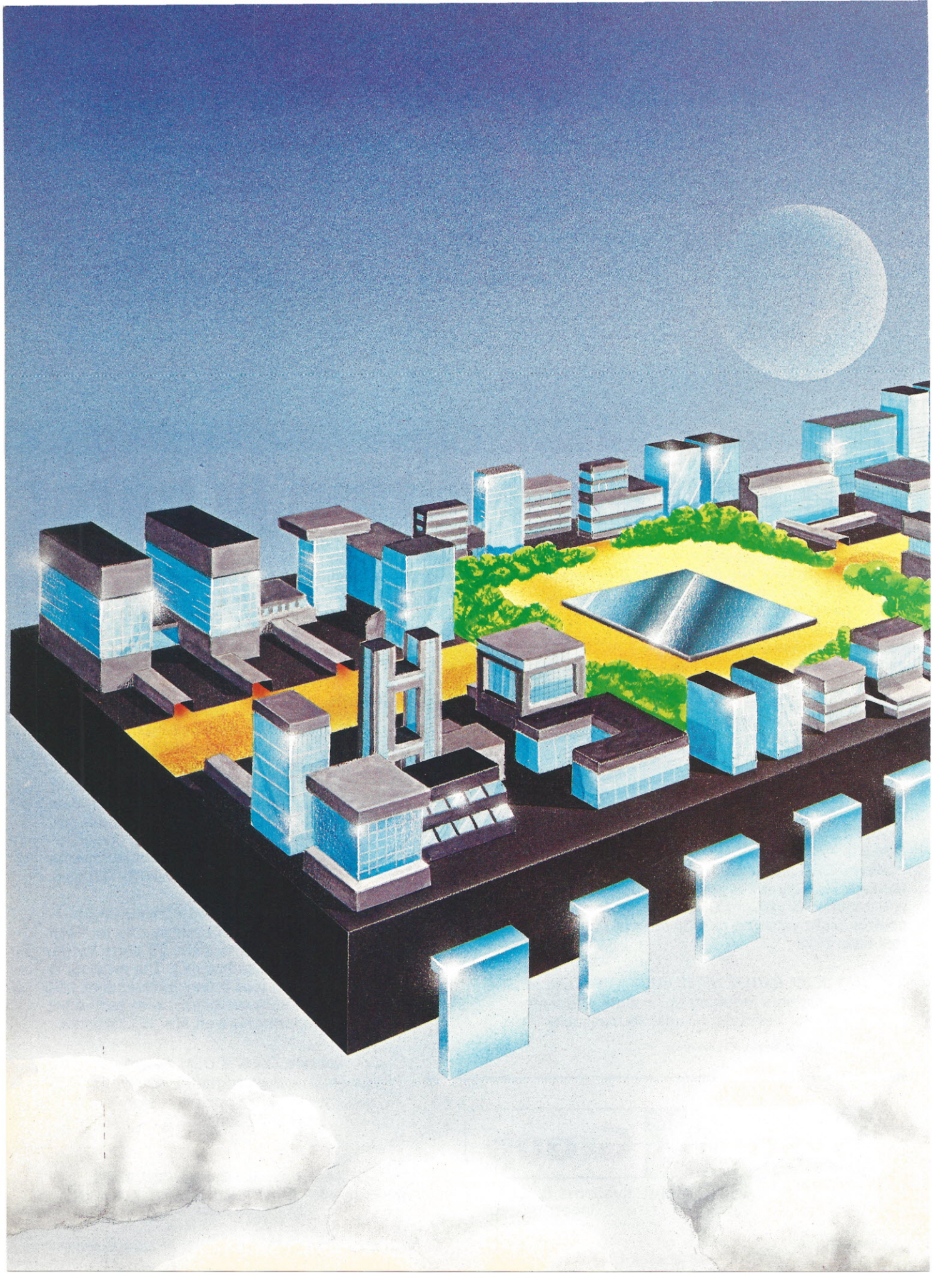
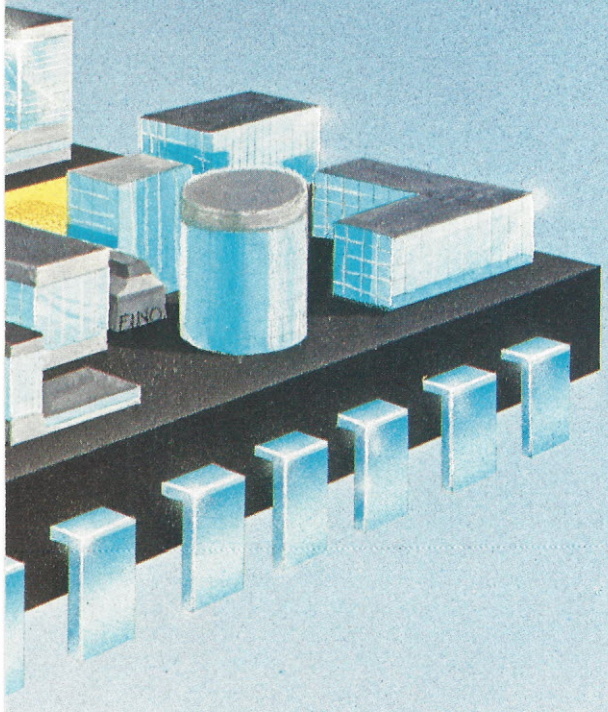
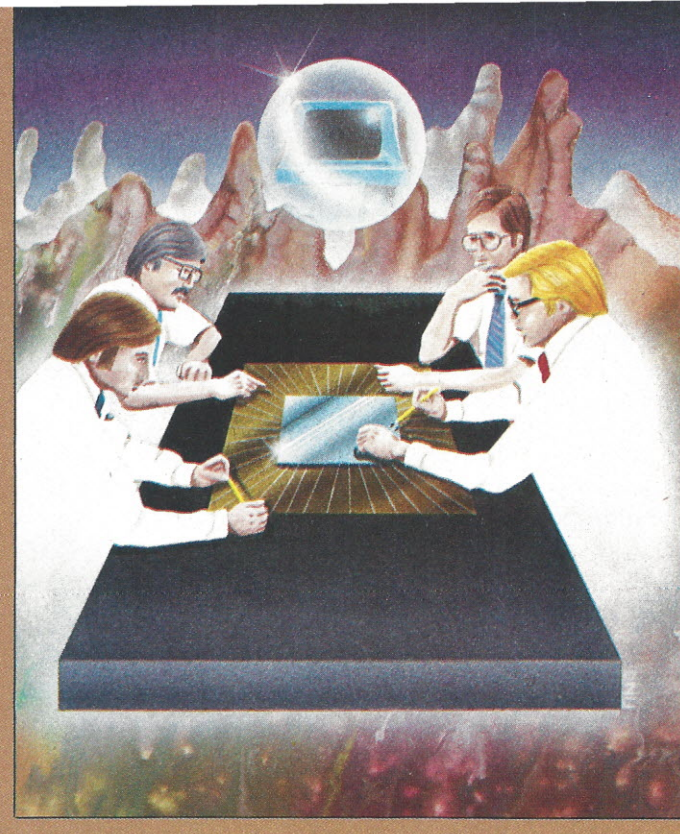






PERSONAL COMPUTERS IN THE 80s

An Overview

With this our last issue for 1980—and one full year into the awesome electronics decade—it seems appropriate to get a cogent perspective on just exactly where the home micro is heading...and what the average man can expect in a mere 10 years.

IA went to the two leaders in the field, Texas Instruments and Apple, and sought out their predictions. Two of their qualified spokesmen provide this startling, overall assessment of the future.

Tom Whitney, Executive VP Engineering, Apple Computers:

I'm sure we all realize that we are on the threshhold of a technology revolution that will dramatically affect all businesses and every aspect of society in the 1980s.

I can hold in my hand a piece of silicon encased in plastic called an integrated circuit. It was first developed in 1975 and contains the equivalent of about 10,000 transistors. With it as a key component, a computer can make one million simple decisions per second. The important fact from a technological point of view is that this device costs about $5. Along with about 85 more similar circuits, we can make a computer

Illustrated by Fino Ortiz

communicate, educate, entertain, and control—all operations that are carried on daily in the home. But today such a computer, with a disk drive and display, costs about $2,000—too much for the average person.

Processing power doubled

Looking to the 1980s, I can now hold a different integrated circuit, the Motorola 6800. Not yet built into any computer, it contains about 30,000 transistors. In just 4 years, technology has provided creative engineers with twice the processing power in one integrated circuit. This power and hence performance per dollar will show up in home computer products in the 80s. There is no immediate slowing of our capability to pack more and more electronics into a small patch of silicon. Because of this, really useful home computers will be available at affordable prices.

In 1978, our computer system cost about 15% of the average worker's annual salary. By 1988 we estimate this will be down to 1%, with even more features and performance. Given something useful to do with such a device, it is evident a much larger percentage of people will buy one.

An interesting statistic is the percentage of personal computers found in the home as the 1980s move on. In 1978 about 200,000 personal computers were sold, with 75% going into homes for hobby, entertainment and educational uses. In 1982 we believe only 25% will go into homes, rising to 50% in 1986 and 75% in 1990.

More and more personal computers are currently being sold as productivity enhancement tools for professionals.

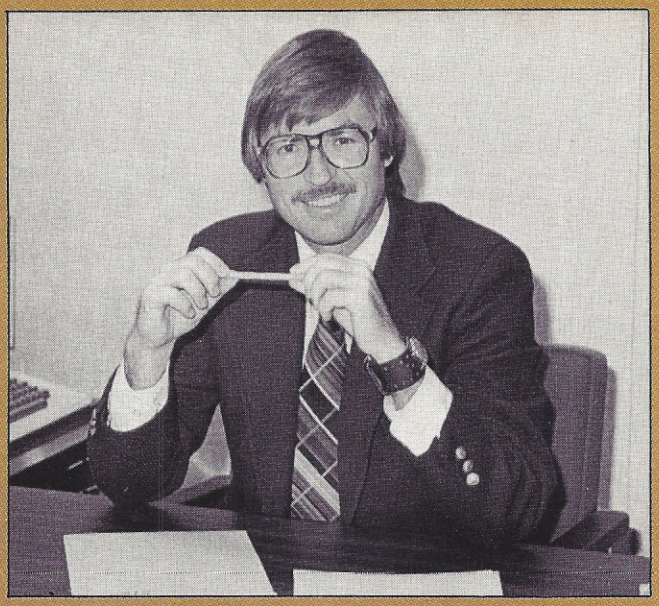
Another requirement for the computer as appliance to become a reality is computer literacy—people have to understand what they do.

Today our schools are creating a generation of consumers who look upon the computer as a friend and a natural extension of their intellect. In one San Francisco Bay junior high for example, all students take a 3-week course on what a computer can do, what it can't do, and a little on how it does it.

By the mid to late 80s, these 7th and 8th graders will become the buying public. Computer literacy will be ordinary rather than exceptional. The computers will not require "experts" to run them, anymore than a 1960s color TV required an expert to tune up the colors.

I see five uses for the computer in the home in the late 1980s. One is control, which relates to turning on the sprinkler system or the morning coffee, implementing a security system, or monitoring and controlling temperature and humidity. Dedicated systems, with imbedded microprocessors, will perform these functions. We estimate no more than 5% of home computers will be involved in control. A computer in a washing machine is not what we mean by the home computer.

A more popular demand for the home computer will be as entertainment. This is the main use for today's under-$1,000 systems, such as the TRS-80 and Atari. Although only 10% will be purchased primarily as entertainment, perhaps 80% will have entertainment as a secondary role. In addition to more exciting action games, home computers will be an always willing and never complaining opponent in skill games such as chess or backgammon. What's more, the desired skill level of the opponent can be controlled, so if your ego needs a win, it can be arranged.



"Advances in integrated circuits will make interaction between a person and a computer natural and understandable."—*Whitney*.

A third important application in the home will be for education. There are two ways computers can educate—you can learn about computers, or you can use the computer as a tool in learning some other subject. The capabilities of the computer to generate color animation and sound permits very creative techniques that can make learning fun—for all ages and subjects. Just as more and more students will use computers at school, the computer in the home will be a near necessity for responsible middle class parents. One can see the advertising now—"If you really care about your child, you'll use the XYZ computer."

The fourth area for home use is data management, comprising 20% of the reason a person will buy a computer. At the simplest level we have home finances, the checkbook, and the Christmas mail list. Word processing, i.e., writing letters, is another common function.

But in the 1980s more people will be working out of their homes, spending part of their week at home with their computer talking to the big computer at work. The scenario will go something like this:

On Monday, Wednesday and Friday, John White, a programmer with a large engineering firm, works at home. He is connected to the office and the large data base via a phone line. He can access remote files in a distant city, and send messages and reports throughout his company. His employer is happy to have him stay home 3 days a week since his space in the office (now up to $10 per square foot per month) can be shared by another programmer who comes in Monday and Wednesday and works at home Tuesday, Thursday, and Saturday. The government is especially pleased since several barrels of imported oil get saved.

As another example, we have Henrietta Housewife planning her busy day. She sits down to her home computer and calls up the specials from the local grocery store. Finding a special on hamburger from A&P, she asks for a comparison of hamburger prices from three other local stores. Deciding A&P has the best overall prices, she includes hamburger with the remainder of her grocery list and transmits it to the store for delivery

Continued on page 118

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*Apple II is a registered trademark of Apple Computers, Inc.
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THE POCKET COMPUTER COMES OF AGE

by David Civan

The most significant new product development at the summer 1980 Consumer Electronics Show in Chicago was the least publicized. Matsushita Electric unveiled the first true pocket computer.

CES is *the* trade show of the electronics industry, an international affair attended by retailers, manufacturers, and writers from all over the world. Every show displays some technological marvel, but never has so significant a new product been introduced at a CES... and been so widely ignored.

Matsushita announced that its pocket computer will be marketed by both Panasonic and Quasar. The two versions will differ only in cosmetics and marketing.

The significance of the hand-held computer (HHC), as Matsushita calls it, lies not in its portability, nor in its low price. It is its unique combination of portability, economy, versatility, expandability, and ease of use.

Matsushita's pocket computer will have a profound impact on the computer industry and on society in general. It is the first *really* personal computer.

The TRS-80, PET, and Apple—good though they are—cannot crack the lucrative mass market. They're *not* personal computers—just well packaged hobbyist computers.

The typical hobbyist computer is versatile and powerful...and very intimidating to the average consumer who is scared of them. And rightly so. Micros are expensive, hard to understand, failure-prone, mutually incompatible, and marketed by companies totally unfamiliar to the average consumer, who has absolutely no guarantee that the manufacturer will be in business a year hence.

What the average consumer wants is something easy to use, reliable, versatile, expandable—and affordable. Large electronics manufacturers are perfectly capable of providing such products—and will. When they do, the personal computing industry will be truly born.

Tom Nugent, national sales manager for Panasonic's Portable Data Systems Division, comments, "Until now, personal computer products have been concentrating on the hobbyist and small business market. The Panasonic HHC is the first true computer designed expressly for consumers. It offers the best of all worlds...a vast range of information and communication services in a portable, design format that the average consumer can understand, operate, and benefit from."

The basic Panasonic HHC, model RL-H1000, weighs only 14 ounces, including rechargeable batteries. It measures 9 inches long, 1¼ inches wide, and 3¾ inches high. It has several functions: it's a translator, an electronic notepad, an electronic secretary, a calendar/clock, and a calculator.

The keyboard has 65 reassignable keys; a full Ascii character set, full cursor control and a special 'help' key that gives instructions on the use of the other keys.

A special liquid-crystal display forms the full Ascii character set using a dot matrix composed of 159 columns of 8 dots each.

Up to four ROM capsules can be installed simultaneously, each with up to 128 kilobytes of information. ROM capsules will be available in a variety of languages for the translator function; a Basic programming language capsule will also be available from Panasonic. Even more capsules can be used simultaneously with the optional ROM expander peripheral.

One kilobyte of RAM is built-in with 500 bytes. RAM can be added in amounts of 4 or 12 kilobytes for a maximum of 73 kilobytes. Panasonic hints, though, that even more RAM will be available using upcoming peripherals. As much as 8 megabytes can be addressed by the HHC.

A new operating system, SNAP, was designed for the 6502-based RL-H1000, which compacts even large and complex programs into a small amount of memory space, and is reportedly compatible with popular programming languages.

All HHC functions are selected from menus. The basic, "ground-state" menu offers a wide selection of 1. clock secretary; 2. memory bank; 3. translator; 4. calculator; 5. program capsules; 6. graphics; 7. telecomputing. Each menu cycles until an item is selected.

Nugent adds, "Due to the modular system concept, this system will not become obsolete. From the hand-held computer unit, the user can expand to an infinite variety of capabilities as his needs expand."

The RL-H1000 is available in three configurations: the basic hand-held at about $400; a personal computing briefcase including 4 kilobytes of RAM, a cassette adapter, and a printer for about $1,100; and a telecomputing briefcase including modem, cassette adapter, and printer for about $1,200.

Available peripherals include the ROM and RAM expanders, a cassette adapter, a printer, a modem, a video adapter, and an input/output driver. Any peripheral can be connected to the hand-held or briefcases. Input/output drivers, each of which can handle any combination of up to six peripherals, are required for more than one. Nugent notes that Panasonic is "looking toward full-size keyboards, disk memories, and the application of voice synthesis" for the future.

Still, many computer retailers and manufacturers refuse to take pocket computers seriously. "Toys," they scoff. The sliderule industry reacted in a similar fashion to the first pocket calculator. Now there's no slide rule industry.

Matsushita is aiming HHC at the mass market. The average consumer simply doesn't want a computer. So his friendly—and very clever—Panasonic or Quasar dealer won't sell him a computer. He will sell him a handy electronic translator...a smart appointment book...a fun electronic game...all in one pocket-size package.

HHC can access the national datanets such as The Source and Micronet. All that's needed is a telecomputing briefcase and a video adapter.

Many electronics companies are already considering adding pocket computers to their product line. Both Craig and Nixdorf plan to upgrade their translators to pocket computers. Radio Shack offers a less sophisticated pocket computer at the correspondingly lower price of $250. And Sharp, which sells a pocket computer in Japan, is actively interested in the American market. Sony is said to be on the verge of unveiling its version.

Pocket computers are the interface of the microcomputing field and the calculator/translator industry. Consumers are accustomed to pocket calculators and translators. Pocket computers, a logical development of calculators and translators, are close enough not to intimidate consumers.

Very few people bother with bulky desk-top calculators. Why should it be different with computers?

Prologue: 1985

Five years after Matsushita introduced its HHC, pocket computers are everywhere. Children play electronic games on their pocket computers. Reporters key in notes for stories. A policeman, thinking he sees a stolen car, makes a quick check of license plates stored in his pocket computer.

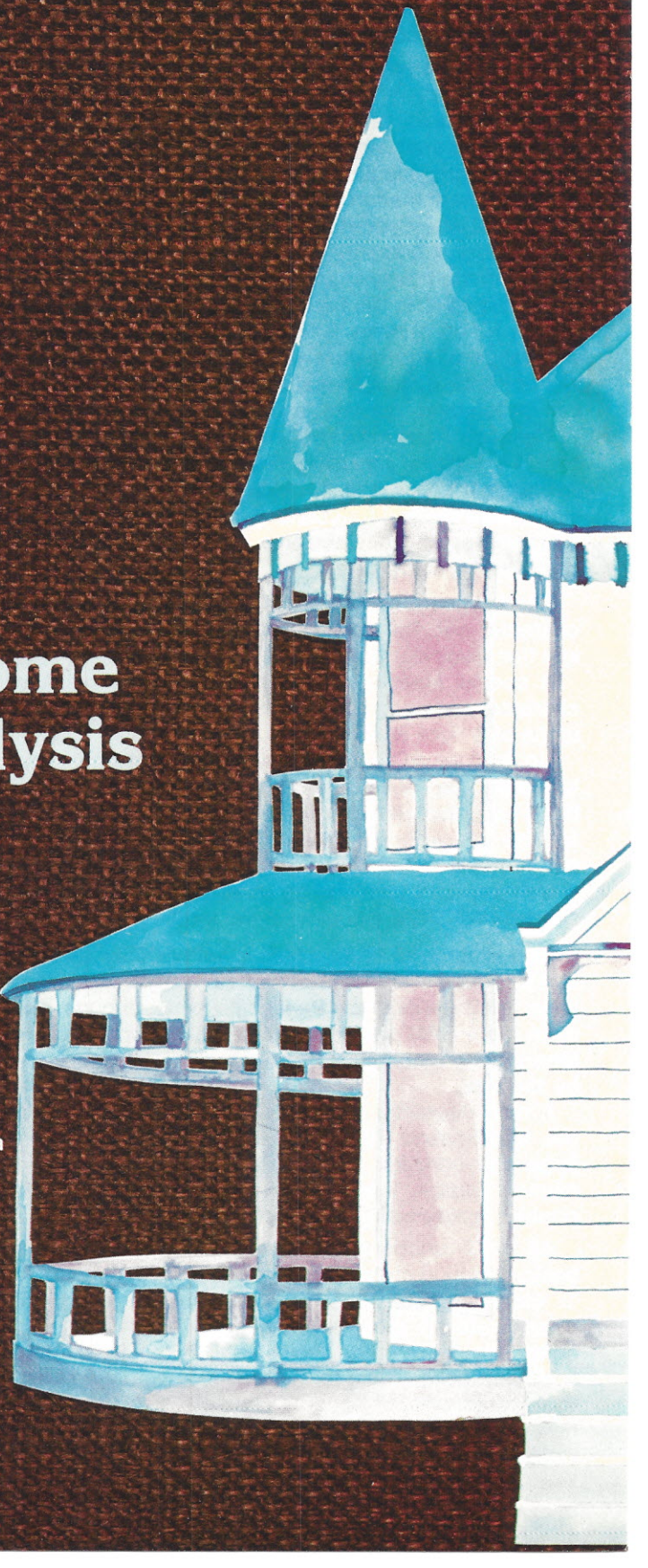
A wide variety is available. Built-in RAM ranges from 4 to 512 kilobytes; prices range from under $50 to $600. There are quite a few brand names, among them Canon, Casio, Hitachi, Mitsubishi, Panasonic, Quasar, Sanyo, Sony, and Toshiba.

All Japanese? Of course. The trend of the 80s continued, virtually eliminating the American computing industry. The pocket computer is another of the superior computer products the Japanese learned to market.

Pocket-size computers may look small, but their impact has been full-size. If America doesn't compete, it won't have a computer future. □

Real Estate Income Investment Analysis

by Averil B. Chatfield



Anyone planning to derive retirement income over a long period of time from an investment in income-producing real estate is faced with the problem of finding a suitable property. The parameter commonly used to determine suitability is the return rate or the ratio of the spendable income to the amount invested.

Unfortunately, income-producing properties are seldom listed at a price providing an acceptable return rate. This program provides a practical tool for quantitatively evaluating the various ways of improving the return rate of prospective income properties. The powerful Micropolis Basic, version 4.0, is the programming language employed. Conversion of this Basic to other forms is relatively easy.

The program leads the operator through the input procedure item by item, provides the opportunity to obtain a listing of the input and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LEE

an opportunity to change it before proceeding. Once satisfied with the input data, the operator is presented with a list of four output options: two tabular and two graphical.

These options allow the operator to determine how purchase price and return rate vary with the input parameters having an influence on their value. Before the selected output is generated, the operator can choose to have the output printed as well as displayed on the CRT.

The main part of the program is contained in lines 1000-1780. Subroutines, described in preceding remark statements, make up the rest. Micropolis Basic allows use of the apostrophy to indicate remarks as well as the key word REM. The apostrophy is used to make the remarks stand out more clearly.

The number of bytes used for storage of real variables, integers and string variables is established by a 'sizes' statement, except where specified by a DIM statement. The first line of the program indicates that 6, 4, and 30 bytes are reserved for real variables, integers and string variables, respectively.

Input is accomplished in lines 1050-1290. The type of information needed is defined in lines 1120-1290. For initial use while becoming familiar with the program, an internal data base is included in lines 1830 and 1840. Lines 1050 and 1060 give the operator the option of selecting this data base or of providing his own.

The string variables used to label the output tables and graphs are defined in lines 1330-1450. Strings containing the Zs specify the form of the numerical output and are used in FMT statements (see lines 2040-2070).

The four-item output option list is provided in lines 1610-1650. Included are:

1 Table of purchase price vs return rate (%) for several values of either variable
2 Table of purchase price and return rate (%) vs one of the input parameters (lines 1330-1370)
3 Plot of purchase price vs return rate (%)
4 Plot of purchase price vs return rate (%) for three values of one of the input parameters (lines 1330-1370)

There is no special reason for generating three plots except that the graphs appeared to be crowded if more than three are included.

```
   RESULTS OF REAL ESTATE INCOME INVESTMENT ANALYSIS

PURCHASE PRICE    RETURN RATE (%)    MORTGAGE PAY-OFF TIME (Y)

 $ 130000.00          6.15                  15.00
 $ 130000.00          9.03                  20.00
 $ 130000.00         10.53                  25.00
 $ 130000.00         11.37                  30.00

DO YOU WANT TO MAKE ANOTHER RUN (Y/N)? N
```

Figure 1: Tabular results of real estate investment analysis.

Line 1680 prompts the operator to enter the desired option number and the 'on-gosub' statement in line 1710 transfers control to the subroutine that generates the selected output. After each run, the operator is given the opportunity to make another run without going through the complete data entry process (lines 1730 and 1740).

Because the parameters (mostly ratios) defined in lines 1330-1360 are used, the return rate and pur-

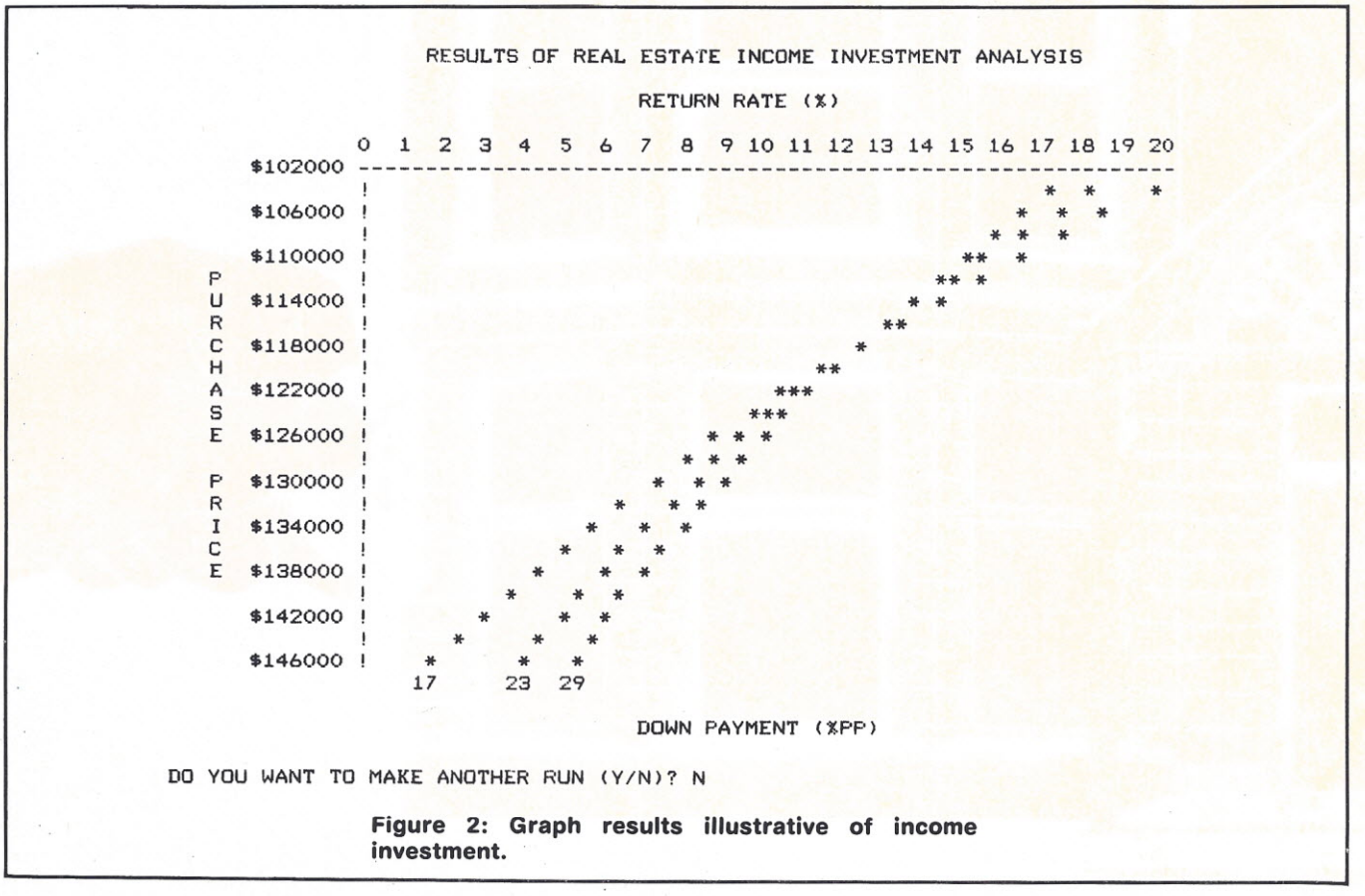

Figure 2: Graph results illustrative of income investment.

Continued on page 122

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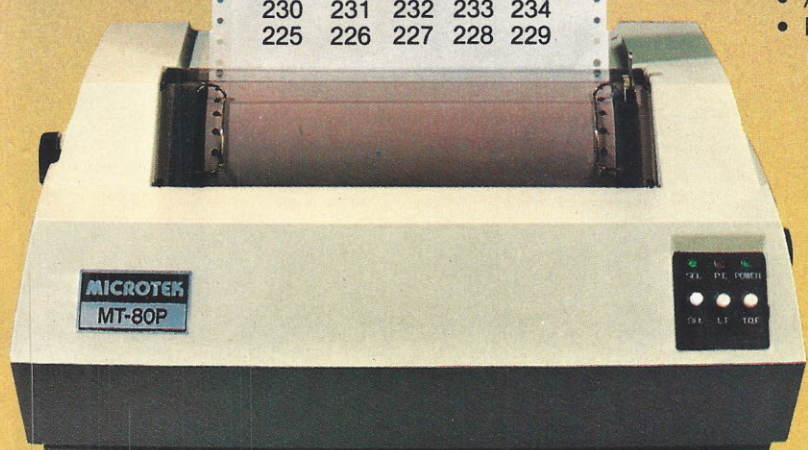

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FINO

MOVE OVER ELECTRONIC MAIL HERE COMES VIEWDATA

by Elizabeth M. Ferrarini

Upon arriving home at 6 p.m. from a day at the office, Sir Toby Belch, a hypothetical London executive, mixes himself a gin and tonic, plops down in his favorite easy chair, and switches on the color tv in his Cheyne Walk apartment.

Electronic circuitry built into the set links it to Belch's telephone line. In turn, the telephone line connects the set to a computer in a government-owned information center in downtown London.

By pressing '113' on a palm-size numeric keypad attached to the tv, Belch calls up the index for the day's *Financial Times.* Five selections, each preceded by a number, appear on the screen. Belch keys '5' for 'Closing Stock Prices.' The first screenful of prices appears. Belch is able to call up subsequent screens of stock prices by pressing the '#' key.

Expressing jubilation over Micro Bongo's 5 point gain, Belch presses the '-' key, and The Financial Times index reappears.

Belch wonders if he should press the selection to see the background file on Micro Bongo but remembers he has a more urgent matter to attend to, namely, paying the rent.

Belch quickly fingers through his checkbook only to find a zero balance. Eager to find the number for the Bank of Moaney, he ravages in a mad panic through a directory supplied with the set. He types the password '10 007 99', which does not appear on the screen. A few seconds later, an index for the bank appears. Belch selects '2' for 'Savings to Checking' and then types '#' and the amount - 1000.

Belch settles back in his chair, sips his gin and tonic, and vacillates over whether he should tune in Act of Parliament, view a pinup of Farrah Farout, or watch the Bionic Chicken on the BBC. While he makes up his mind, the printer in the next room merrily taps out a confirmation of the bank transmissions and the charges for information service.

This scenario may sound like a new twist to the office of the future. But similar scenarios take place today in 4,300 London homes and offices because of the ingenuity of the British Post Office (BPO).

Unlike the U.S. postal service, the BPO, like other European post offices, owns, operates, and regulates all communication services such as mail, telephone, telex, and satellite communications.

Viewdata is the generic name the BPO uses to describe its interactive information system for home or office. Prestel is the tradename of the BPO's national viewdata service.

Prestel allows subscribers to gain access easily to large amounts of information stored in a computer database using the existing telephone network as the carrier medium and a modified television set as the receiver.

Credit for the Viewdata concept and Prestel belongs to Sam Fedida, a former BPO research engineer. Fedida conceived the idea during the late 60s when he was working on a computer register of hotel vacancies. He realized that system costs would be reduced if the customer was able to gain access to the information without the need for clerks or intermediaries. When he joined the BPO to work on the Viewphone (similar to AT&T's picture phone), Fedida had an opportunity to expand his ideas. From experiments with putting text on to Viewphones in hopes of increasing telephone usage, he moved to the idea of adapting the ordinary television set as a receiver of textual information.

By July 1974, a working model of Viewdata was demonstrated to Sir Edward Fennessey, then deputy chairman of the post office and managing director of telecommunications. Fennessey immediately had the marketing division of the BPO explore the idea of Viewdata.

In 1976, the BPO ran a test of its viewdata system in London. Two years later, the BPO embarked on a test service of Prestel in London with 1,500 subscribers.

Because the BPO was providing a new means of communicating information, it did not want to become a publisher. The BPO decided to become a common carrier by providing the lines, switching, and computer power and storage within the network. The data would come from outsiders or "information providers" who would sell their data to a mass market. The BPO would allow any organization to store as many pages as it wished but would not allow any "grossly offensive or unsuitable material." Using this approach, the BPO developed the test service in close cooperation with 150 information providers. Some of these providers included American Express Company, *The Financial Times*, and British Airways.

In turn, the information providers are responsible for formatting their data according to the BPO rules, updating it, advertising it, and paying the BPO to store it. The information provider would be paid on an access basis.

The BPO stored the information in a network of identical GEC 4080 computers, which would be kept updated with changes. Equipped with several computers, ten telephone exchanges in London acted as Prestel computer centers. A local call connected the subscriber directly to the nearest computer center.

Encouraged by the success of its test service, the BPO announced Prestel as a public service on March 27, 1979. However, the adapted television sets needed to receive the service won't be available in volume until the mid-1980s.

An adapted television set consists of a box of additional electronic circuitry, a modem, and a plug-in or attached keypad. Controlled by one or more microprocessors, this box of large-scale integrated circuitry features an auto-dialer, an identification number, a character generator, a page store, and an interface board.

The auto-dialer stores the telephone numbers of the computers it is likely to access and will dial them up at the press of a button. An identification number lets the Prestel computer know which terminal to bill for page

access. The interface board allows the set to be connected to the telephone lines. Data is transmitted to the television set at a speed of 1200 bits-per-second by the Prestel computer and received from the set at 75 bits-per-second.

As data from the Prestel computer arrives at the television in the form of audible tones, the modem changes these tones back into digital computer codes. The shapes of characters that correspond to the digital codes are fetched from the character generator's RAM and passed to the page store for display on the screen. Graphics are built up as a mosaic of rectangles.

Ninety-six different upper- and lower-case characters, symbols and graphics can be generated in seven colors on the set.

The subscriber uses a keypad to access the desired page of information, to hold a page for viewing, or to cancel the keying instruction.

A page or frame of information in the Prestel data base is the amount of text or graphics that can be displayed on the tv set at one time. At present, that is a maximum of 24 lines by 40 characters each or a total of 960 characters.

To obtain Prestel information with an adapted television set, the subscriber turns on the set, plugs in the keypad, makes sure the telephone is not in use, and then switches to Prestel according to the operating instructions supplied with the set. During this process, the auto-dialer makes a local telephone call to a Prestel computer center, and then the Prestel computer scans the identification number built into the subscriber's set.

Despite Prestel's many possibilities, its use depends on a subscriber's willingness to pay...

Once the "Welcome to Prestel" display appears on the screen, the subscriber can access the "tree-structured text" in several ways. By pressing # on the keypad, the subscriber calls up the General Index. This index contains a variety of selections, each preceded with a number. The subscriber keys the single digit that corresponds to the subject of interest. For example, the subscriber would key 5 to view the alphabetical index. This prompts a new index to appear that is specific to that subject. Further single-key selections narrow the choice, for example, from 'government information' to 'parliament' to 'legislation' until the desired page is located.

Because each page in the Prestel data base is assigned a number, the subscriber can access the desired page by the number assigned to it in the Prestel User Guide and Directory.

By pressing one of the special keys on the keypad, the subscriber can return directly to the main index to the previous page or repeat an existing page. One of the keys is used to access information on subjects that request more space than a single frame can accommodate. The extra frames are labeled a, b, c, etc.

A Prestel subscriber has access to about 200,000 pages of information ranging from airplane time tables, theater guides, news and encyclopedia information to games, quizzes and advertisements.

Although Prestel has something for everyone, the business community can take advantage of a large number of business information services operating through Prestel.

Established in December 1978 by *The Financial Times* and *Exchange Telegraph*, Fintel, the largest of the Prestel information providers, offers analyses and comments on industry and finance, and daily news. Datastream International, a financial company, provides stock market information, economic forecasts, and a major data bank of company account displays. The London Stock Exchange lists on Prestel each day the prices of 800 leading stocks.

Although Prestel was designed as a public information service, the BPO allows information providers to restrict access to designated users or what is called a closed group of users. For example, an information provider, such as a manufacturer, may elect to put its company parts list on Prestel. The company would allow its sales people to access the data by assigning them a special Prestel access code.

Because the BPO does not have a monopoly on viewdata systems, a business may develop its own viewdata tied into Prestel. To set one up, a business needs a minicomputer and connections to the telephone network. But any equipment that ties into Prestel must be approved by the BPO. Such a system would allow a salesman to call up his/her company's viewdata system from a customer's Prestel-adapted televison set.

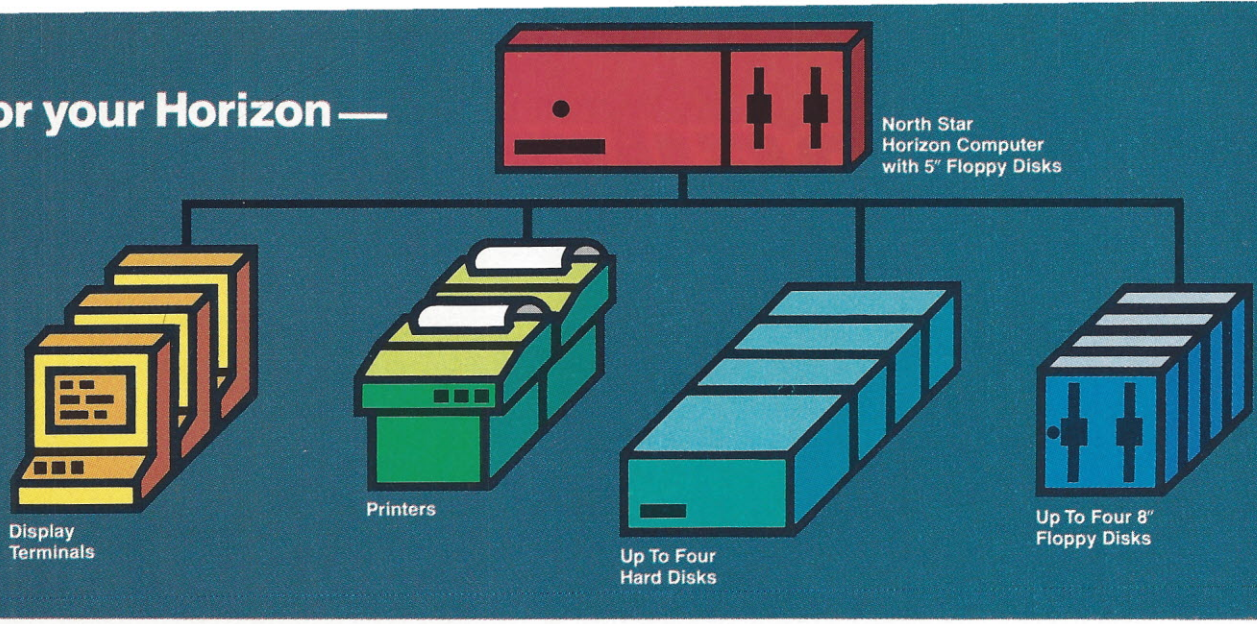
Further development of Prestel means expanding its interactive capabilities. At present a subscriber can interact with a Prestel computer to play games and answer questions. In the future, subscribers will be able to make direct purchases by supplying their credit card number to an advertiser's response frame. The computer would automatically forward the information to the advertiser. The advertiser would then send the goods to the subscriber or the subscriber would pick them up.

A more realistic development in Prestel and private viewdata systems appears to be the "intelligent viewdata terminal" that has independent computing power, memory, a storage device, and a printer. An intelligent viewdata terminal allows a user to store viewdata frames of information, such as stock market prices. Using this information, an investment manager, for example, could then use the terminal's computing power to undertake his own portfolio analysis. If the user didn't feel like going into the office, he/she could leave a message for the secretary on Prestel.

Despite Prestel's many future possibilities, its use depends on a subscriber's willingness to pay for the information.

While connected to the Prestel computer, the subscriber incurs three separate costs. The subscriber pays for the local telephone call and the time logged on

For your Horizon—



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the computer. The latter is set at four cents a minute for the start of the service. The user pays a charge levied on each frame of information provided. This may be zero for advertisers and public affairs pages or up to 20 to 25 cents for business/industrial information. However, information aimed at the general public is priced between one and six cents per page.

The average hourly cost for using Prestel comes to about 20 cents a minute or $12 an hour, according to David Simons, a consultant from New York.

The BPO requires that each information provider display the price on the page in the upper-right corner. The Prestel computer gives each subscriber a running total of the amount of each call and the total billing for the current quarter. The charges levied by the information provider are collected by the BPO, which passes the money to the information provider after deducting a surcharge.

The information provider pays the BPO a one-time charge and about $8 for each page used by the service.

Besides the cost of the information, Prestel has some other flaws. For example, the circuitry needed to modify a color television set to receive Prestel costs about $1,000. This high cost is because the specialized Prestel semiconductors and subassemblies, such as modems, have only been in production a short time. These components require a few years evolution before low production costs can be achieved. Once the units to adapt a set reach a price range that the mass market can afford, there is no guarantee that people are going to want to pay for the information.

The resolution on a modified set has not reached the point where someone could sit in front of a set and read Shakespeare.

Some companies, such as mailorder houses, find it difficult to advertise some of their products on Prestel with the mosaic graphic technique. Thus, Playboy centerfolds won't fly on this service yet.

Apart from the information extravaganza with which the BPO tempts the public, the development of a mass market for Prestel depends on rapidly falling prices of information and the availability of low-cost television sets or adapters to receive it.

On the other hand, the business community sees the price of the information and the necessary equipment as minor. Businesses will pay almost anything to get the appropriate data, especially if the data is easy to obtain.

To keep the business community interested in Prestel, the BPO will need to offer more business services. Thus far the most popular page on the service is the Desert Rat game in which Montgomery and Rommel do battle.

The Prestel service has taken its bumps and grinds on a foundation of millions of BPO's pounds ($51 million as of 1979). Although the BPO does not have to declare a profit, it claims that the cost of information and price of television sets and adapters to receive Prestel will plummet. The BPO hopes the service will be self-sufficient in a few years. Nonetheless, the BPO prides itself on being the first with the idea that it decided to offer Prestel to the rest of the world. By doing so, the BPO can have Prestel accepted as the viewdata standard, especially in Europe, and can take advantage of the economies of scale essential in producing television sets using LSI technology.

The BPO's first attempt at marketing Prestel was to other European post offices. The Deutsche Bundespost (German post office) took delivery of a GEC 4080 computer from GEC Computers Ltd. and a complete line of software from the BPO. The market trial for the German viewdata system called Bildschirmtext will begin in 1980 in Berlin and Dusseldorf.

For its service called Viewdata, the Netherland's post office is operating a GEC 4082 system with BPO's Prestel software.

However, France, Canada, and Sweden have developed rival viewdata systems, which they also intend to market outside their countries. A menagerie of viewdata systems in Europe could mean a quick need for standards if the British want to dabble in a French data base. But no one in Europe seems to agree on what these standards should be.

France, Canada, and Sweden have developed rival viewdata systems to market outside their countries

To market the Prestel software in the private sector of Europe and in the U.S., the British National Enterprise Board, a government organization created to export the country's expertise, has created a wholly-owned subsidiary called Aregon International, Ltd. Aregon Group, Inc. markets the software in the U.S.

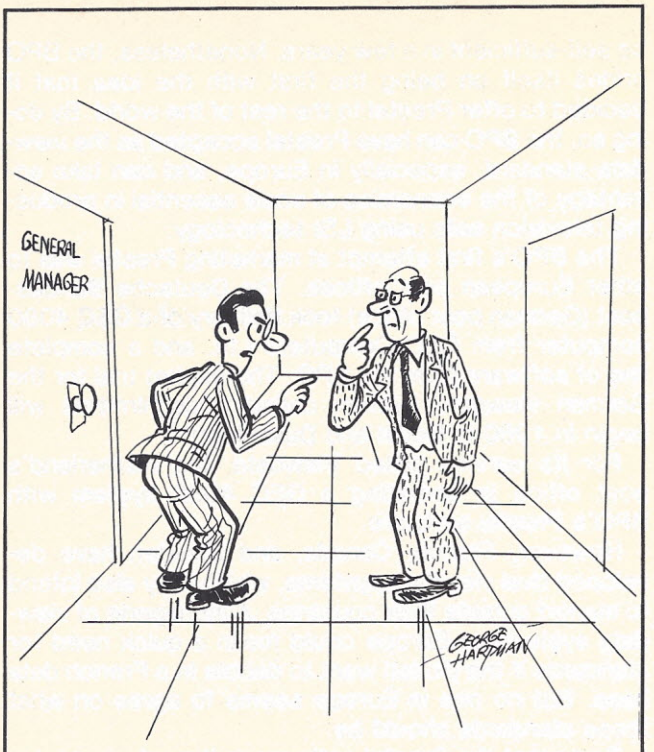
Because GEC computers are not known in the United States, Aregon adapted the Prestel software to the requirements of U.S. communications technology. Called Viewdata, the software operates on a Digital Equipment Corporation PDP 11/70, 11/34 or 11/44, and uses Intelligent Systems Corp.'s Intercolor terminals.

When asked how Viewdata compares with other data base management software, John Bately, vice president of Aregon Group, Inc., said that Viewdata is economical and simple to use. According to Bately, a company can use the software to set-up its own in-house viewdata system, which allows employees to access timely information. Aregon has concentrated its marketing efforts on signing contracts with major U.S. corporations.

In June 1979, General Telephone and Electronics Corp. licensed the Viewdata software from Aregon Group, Inc. Prior to signing the agreement, GTE had undertaken a one-man development project on an interactive home information system.

The company has run in-house tests with the Viewdata software at its GTE Computer Center in Tampa, Florida. Apart from the tests, GTE has not announced any elaborate plans for Viewdata.

Meanwhile, the J. Walter Thompson Corp., the largest independent advertising agency in the world,



"I'd like to hire you back, Figsby....the machine we bought to replace you doesn't work very well either."

has set up a system with Aregon's Viewdata software. The largest division of the JWT group wants to test and experiment with how its clients' products would appear on this type of medium.

Subsidiary company formed

The most ambitious undertaking of a viewdata service in the U.S. belongs to Florida's Knight-Ridder, publishers of the *Miami Herald,* the *Philadelphia Inquirer,* and other newspapers. To test user reaction to its viewdata service, Viewtron, Knight-Ridder has formed a subsidiary called Viewdata Corp. of America.

American Telephone and Telegraph's Southern Bell subsidiary has agreed to design 27 user terminals for the test, which will take place late in the 1980s. AT&T also plans to install and maintain the terminals during the trial as well as to supply the lines.

The test, which will take place in Coral Gables, Florida for six months, involves placing a terminal in a user's home for several weeks. The user is free to access any of the 12,000 pages of information scheduled to be on service.

Information providers for the test service include the *Miami Herald, New York Times,* Associated Press, and Dow Jones Company. Eastern Airlines, Sears Roebuck, and J.C. Penney plan to advertise on Viewtron.

The results of the test service will determine whether or not Viewtron Corp. of America lives or dies.

If Knight-Ridder's $1.3-million investment for the Viewtron test service seems small compared to the BPO's investment in Prestel, there is good reason for it. One has to remember that the U.S. government does not enjoy a monopoly over telecommunication services like the BPO and other European countries. This means that viewdata services in the U.S. will probably be private developments. However, starting up a viewdata service requires a massive investment in equipment, software, and people to update the data base. On the other hand, the Federal Communications Commission's deregulation of AT&T's activities means that the few private companies that can afford to set up viewdata services will get some competition.

Significance is environmental

The viewdata concept has not introduced any significant technological developments. Instead, viewdata is a new type of environment. An environment that lets people deal with information, not with the paper it is written on. The cost of moving quantities of paper and then disposing of it as garbage is too high to continue unchanged.

The paperless viewdata environment won't be created until some preliminary questions are answered. Among these questions are the following: What types of information are marketable to the mass market, to the businessman? What are consumers willing to pay for information? What features do customers want in a terminal? Will the FCC make new regulations? How will privacy and security of data be handled? If different companies in the U.S. develop viewdata services, will their systems be compatible?

The effective development of any viewdata service needs the unbiased reactions of people from all walks of life, according to one unidentified attendee at the Viewdata 80 conference in London. □

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Microcomputing, June 1980

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Glenn A. Hart
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Program Locator System for North Star

by Mark Kurzmack

Have you ever spent a frustrating 15 minutes listing the directory of every disk you own in an attempt to locate one program that was used 6 months ago? Or do you have four versions of a program on three different disks, and can't remember how one differs from the other? Or perhaps you found some programs listed on a disk, the names of which mean nothing to you? If so the programs to follow may solve these dilemmas.

They, were however, written with certain requirements in mind. These include an ability to (1) identify what disk a program is on, (2) list contents of several disks without reloading the drives, (3) list all programs of a particular type, such as games, math, etc., and (4) give a brief description of each program identifying—but not actually listing—its contents.

The programs are written in Basic (North Star release 4) and were used on a North Star Horizon (with 32K) and a Soroc IQ 120 terminal. They should run 24K with no problem, and on other CRTs with only minor modification.

The locater system consists of three programs (Setup, File, and Search) plus a large datafile called Diskfile. Setup is a short preliminary program designed to store variables in Diskfile that are common to both the other programs. It also allows these variables to be easily changed. File is used to add, delete or change the program records, and Search allows a particular disk, type of program, etc., to be listed. It also allows a program to be located by name.

Datafile contains a header area of 700 bytes. The first 300 are used for storing deleted record numbers. I've allowed for deletion of up to 38 records at once. This should be adequate, since the deleted records are removed from this area as new records are added. The remaining bytes are used to store the string variables entered by Setup. The rest of the file can store 79-byte records containing information about individual programs.

The disk I use has 10 blocks for DOS, 50 blocks for North Star Basic (with automatic chain of the Search program), Setup (10 blocks), Search (12 blocks), and File (13 blocks). The remaining 255 blocks are used for Diskfile, which permits storage for over 800 programs.

Setup: The string of variables used in File and Search are defined in Setup. L1$, L2$, and L3$ are blanks which are added to the program name, description, etc., to insure that all the space allotted for the string variable is used. If this isn't done, the length of the records will vary, and random access will not work. L4$ is the name of the type 3 datafile in which the records are stored. A1$-A9$ are just words that are frequently used.

B1$ defines the type of file. If you use other types, they can be added by changing 'dim B1$' (in all three programs), adding the additional types in Setup (eight spaces per type), and changing line 600 in File.

C0$ is the list of variety codes. Each code is allowed 12 spaces. The only code that cannot be changed is 'deleted'. This must remain in the first 12 spaces. Changing the codes in Setup will automatically change them in the other programs.

Setup writes the string variables into Diskfile starting with byte 200 and ending at 615. 'Write #0,%200' means write the contents of buffer #0 onto the disk starting at byte 200. The % is North Star's symbol for random access. 'Noendmark' prevents the computer from writing an end of file mark each time the file is written onto.

File: This program makes additions and corrections to the records in Diskfile. Line 10 sets the line length to 80. If your CRT has fewer than 80 characters per line, you may have to make some adjustments in the printout so that all the information will fit. In lines 70 and 80, the string variables stored by Setup are read from diskfile. Lines 90-140 are the menu which allows you to choose what you want to do.

The function 'inchar$(0)' allows the input of a single character from #0. 'Val' converts the string expression into a numeric value. This eliminates the use of a carriage return after entering the number. The line may be replaced by an 'input' function if necessary. In line 150, the CRT display is cleared. These codes are for a Soroc 120. Substitute the appropriate codes for your terminal, or leave this line and line 820 out. In lines 910-930, a backspace subroutine is used. 'Chr$(8)' is the code to backspace and should also be personalized for your CRT.

The total number of records, N, and the number of deleted records, N1, are read from the first 10 bytes of Diskfile in lines 190-210. Bytes 11 to 195 are used to store the record numbers of any deleted records. When a listing is added, the program checks N1>0. If there are any deleted records, the number of the last one is read, and the counter is reset. If there are no deleted records, N is incremented and the record is assigned the new value of N.

The subroutines in line 220 allow each line to be entered separately. The file is entered in lines so that parts can be changed and corrected without rewriting the entire file. Line 810 is the subroutine to display the entire listing. Lines 260-310 allow corrections to be made to individual lines. When all lines are correct, the program goes to 330 where the entry is written into Diskfile.

In order to insure that the string variables have filled all of the space allotted, L1$, L2$, and L3$, which are filled with blanks, are added to the strings. In line 350, A is the number of the record. Record #1 is written at byte [621 + (1*79)] = 700, and each additional record is allowed 79 bytes. The ampersand is the symbol for byte access. The variables G and D are thus allotted only one byte each. North Star sets aside 5 bytes for each number or numeric variable and string variables require their 'dim' + 2 bytes.

Deletion of records is handled in lines 380-560. Lines 530-550 correct the value of N1 (the number of deleted records), and store the number of the deleted

record in Diskfile. Next the program name is changed to Deleted and the variables are blanked. Finally the record is rewritten into Diskfile as a deleted file. The advantage to retaining deleted files is that the program does not have to keep track of gaps in the sequence of record numbers.

Changing a listing is accomplished in lines 580-610 by recalling the file from the disk and transferring to 230, the section that allows corrections. Lines 660 to 790 are subroutines used to add a file. To prevent entries from exceeding the field length, the longer inputs print a] on the last allowable space and then backspaces to the first space of the field. F, which appears in several lines, is the number of spaces to backspace.

Lines 840, 850, and 970 are examples of North Star's treatment of variables, and may have to be modified for your Basic. For instance in line 840, C0$ is the name of the string variable containing 18 variety codes of 12 characters each. C is the variable that selects which code will be used. If C = 0 characters, 1 to 12 will be displayed; if C = 1, then characters 13 to 24 are selected.

Search: This program examines the entries in Diskfile, and prints information about those entries that satisfy certain criteria. In line 30, the codes to clear the screen are set equal to the variable X1$. Changing X1$ will change these codes in all the necessary places. The menu in lines 140 to 180 allows selection of the type of search. Instead of reading the entire content of each listing, only the necessary bytes are read from Diskfile, and compared to the search parameters.

For instance, to search for a particular program name, the section beginning at 220 is used. First, N$ is set equal to the program name. If the name is less than eight characters long, the additional spaces are filled with blanks by adding L$. Line 240 is used to print out a heading. Next, each entry is examined at the eight bytes containing the program name, A$. If A$ is the same as N$ (the name we are searching for), the subroutine at 540 is used to print out the record. For each program whose name is the same as N$, the listing includes: record number, name, disk number, variety code, type (and hex location if type 1), size in blocks, and 39 characters which are used for a program description.

As indicated in the menu, the program allows a listing of all programs with a given name, a listing of an entire disk, a list of all the programs of a particular variety (such as all the games or math programs), or a list of all files which are source codes for assembly language programs. Also, all the programs stored in Diskfile can be listed. Changing line 270 to allow only part of A$ to be compared with part of N$ (i.e., compare the first four characters of A$ with the first four of N$) will permit searches to be made for similar programs or allow a program to be found even if only part of the name is known.

Although these programs have been written to specific requirements, the basic structure easily adapts to any similar system. The Search program is not as efficient as it could be, since each record must be examined. However, even with several hundred programs, a search for a particular program takes less than 30 seconds.

Entering the information for all your accumulated programs may seem like a large job, but once the initial effort is complete, the work required to maintain the file is minimal. □

Program on page 132

Basic in Your Pocket: The Hand-Held Micro

by Alan R. Miller

The Altair 8800 microcomputer first became available about 5 years ago. It could be equipped with an I/O board, 4K of memory and a Basic interpreter for about $600. A second-hand teletype cost another few hundred dollars. Although the resulting computer was powerful in many respects, it is primitive compared to today's micro, with its 64K of memory, several floppy disks, video terminal, and printer.

Sharp recently introduced a calculator that features symbolic notation and a 24-character alphanumeric display. The user can move a cursor across the display to make corrections, even after execution of a command. User programmability, however, is limited and branching is not provided. Nevertheless, this calculator represents a significant upward step in convenience.

Radio Shack has now bridged the gap between calculator and computer. The new TRS80 hand-held features a powerful Basic interpreter, is under 3 by 7 inches and priced at $250. There is a full alphanumeric typewriter-style keyboard, and a standard 10-key pad. The 24-character liquid-crystal display is 3/8-inch high. Characters are formed with a 5 by 7 dot matrix. There is a latching shift key that switches the alphabetic keys into symbols like $, %, and #. However, the user can define 18 of the keys to do things like execute a program or display function.

Calculations are performed with 10-digit accuracy, and have an exponential range of 10^{99}. The memory contains over 12K. The Basic interpreter takes 7K, and the monitor uses 4K. This leaves 1.5K for user programs.

The Basic interpreter contains the standard math functions such as square root, log, exp sin, arctan, etc. In addition, there are features of extended Basic such as a full text editor, multiple statements per line, and a 'print using' command for output formatting. On the other hand, there are no string functions. Strings of up to 7 characters can be defined and printed:

```
S$ = "UPPER"
```

but they cannot be manipulated.

The TRS80 calculator can be used in direct mode for solving short problems, or can be programmed in Basic for longer problems. Its action in direct mode is more like APL than Basic. Commands are given without a 'print' statement:

```
1/7
SIN 30
LOG (3.5 / 13)
```

The variables A through Z, or A(1) through A(26), can be used in both direct mode and in programming mode. In direct mode, the results are printed immediately after the 'enter' key is pressed.

```
A = 3
B = 4
C = A * A + B * B
```

The previous line can be recalled, and edited by moving the cursor to the desired position. The line is re-excuted by pressing the 'enter' key. Suppose the line:

```
C/(A * A – B * D)
```

was accidently typed instead of

```
C/(A * A – B * B).
```

The line can be redisplayed by pressing one of the cursor-control keys, moving over the incorrect letter D and retyping B.

The power of the pocket micro lies in programmability. There can be over 1400 steps stored in the

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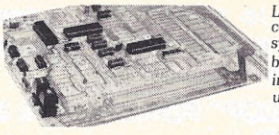
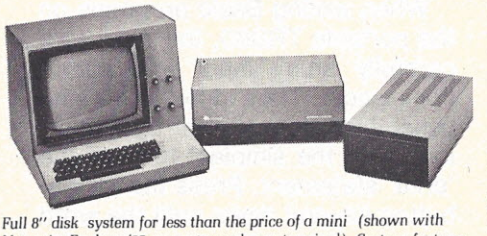
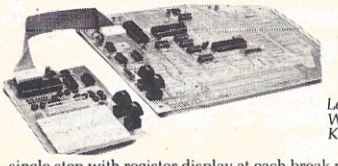


Level "A" is a complete operating system, perfect for beginners, hobbyists, industrial controller use. $129.95



Full 8" disk system for less than the price of a mini (shown with Netronics Explorer/85 computer and new terminal). System features floppy drive from Control Data Corp., world's largest maker of memory storage systems (not a hobby brand!)



Level "A" With Hex Keypad/Display.

LEVEL "A" SPECIFICATIONS

Explorer/85's Level "A" system features the advanced Intel 8085 cpu, an 8355 ROM with 2k deluxe monitor/operating system, and an advanced 8155 RAM I/O . . . all on a single motherboard with room for RAM/ROM/PROM/EPROM and S-100 expansion, plus generous prototyping space.

PC Board: Glass epoxy, plated through holes with solder mask. • **I/O:** Provisions for 25-pin (DB25) connector for terminal serial I/O, which can also support a paper tape reader . . . cassette tape recorder input and output . . . cassette tape control output . . . LED output indicator on SOD (serial output) line . . . printer interface (less drivers) . . . total of four 8-bit plus one 6-bit I/O ports. • **Crystal Frequency:** 6.144 MHz. • **Control Switches:** Reset and user (RST 7.5) interrupt . . . additional provisions for RST 5.5, 6.5 and TRAP interrupts onboard. • **Counter/Timer:** Programmable, 14-bit binary. • **System RAM:** 256 bytes located at F800, ideal for smaller systems and for use as an isolated stack area in expanded systems . . . RAM expandable to 64K via S-100 bus or 4k on motherboard.

System Monitor (Terminal Version): 2k bytes of deluxe system monitor ROM located at F800, leaving 0000 free for user RAM/ROM. Features include tape load with labeling . . . examine/change contents of memory . . . insert data . . . warm start . . . examine and change all registers . . . single step with register display at each break point, a debugging/training feature . . . go to execution address . . . move blocks of memory from one location to another . . . fill blocks of memory with a constant . . . display blocks of memory . . . automatic baud rate selection to 9600 baud . . . variable display line length control (1-255 characters/line) . . . channelized I/O monitor routine with 8-bit parallel output for high-speed printer . . . serial console in and console out channel so that monitor can communicate with I/O ports.

System Monitor (Hex Keypad/Display Version): Tape load with labeling . . . tape dump with labeling . . . examine/change contents of memory . . . insert data . . . warm start . . . examine and change all registers . . . single step with register display at each break point . . . go to execution address. Level "A" in this version makes a perfect controller for industrial applications, and is programmed using the Netronics Hex Keypad/Display. It is low cost, perfect for beginners.

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Calculator type keypad with 24 system-defined and 16 user-defined keys. Six digit calculator-type display, that displays full address plus data as well as register and status information.

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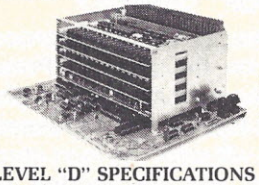
Level "B" provides the S-100 signals plus buffers/drivers to support up to six S-100 bus boards, and includes: address decoding for onboard 4k RAM expansion selectable in 4k blocks . . . address decoding for onboard 8k EPROM expansion selectable in 8k blocks . . . address and data bus drivers for onboard expansion . . . wait state generator (jumper selectable), to allow the use of slower memories . . . two separate 5 volt regulators.

LEVEL "C" SPECIFICATIONS

Level "C" expands Explorer/85's motherboard with a card cage, allowing you to plug up to six S-100 cards directly into the motherboard. Both cage and card are neatly contained inside Explorer's deluxe steel cabinet. Level "C" includes a sheet metal superstructure, a 5-card, gold plated S-100 extension PC board that plugs into the motherboard. Just add required number of S-100 connectors.



Explorer/85 With Level "C" Card Cage.

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memory. Reserved words such as 'goto', 'for', 'next', 'print' only count as one step. But each letter of a string and each digit of a constant also counts as one step. Lines can be as long as 80 characters.

Each line of the source program begins with line number and is followed by the instruction. The 'enter' command stores the line in memory. A line that has already been entered can be edited by giving the command 'list' followed by the line number. The cursor is moved to the desired position to make changes.

Characters can then be inserted or deleted. When a line is in its desired form, it is stored in the memory by pressing 'enter'. New lines are automatically inserted into the source program in numeric order.

During editing, a line number can be changed and the line stored in its new place in the source program. But this does not change the original line, which must be separately deleted by typing the original line number.

Program execution

There is room in the memory for many independent Basic programs. Suppose a program to determine the current balance of an account begins at line 100, and a calendar program begins at 200. They can be executed, respectively, with commands:

```
RUN 100
RUN 200
```

But there is a more convenient way. Each main program and each subroutine can begin with a label consisting of a string such as:

```
100 "BAL"
200 "CALEN"
400 "INVER"
```

In this case, the command:

```
RUN "CALEN"
```

can be given to start the program at line 200. Such labels can also be used by the program itself. The subroutine at line 400 can be called from the calendar program by giving either of the following commands:

```
220 GOSUB "INVER"
220 GOSUB 400
```

The advantage of the string reference is that it is not necessary to know the actual line number of a routine.

The two lower rows of keys are user programmable. Thus the C key can be set up to directly execute the Calen program. Similarly, the B key can be devoted to the Bal program. In this way, it is only necessary to press 'shift-C' and 'enter' and the Calen program will execute.

Basic differences

When writing Basic programs on the portable TRS80, the user must carefully study input and output commands. They differ from the usual Basic forms. First try a short loop with the simplest form of the 'print' statement. Press the 'mode' button several times until the word 'pro' appears at the top of the display. This puts the computer into programming mode. Then type in this program:

```
100 "LOOP" FOR Z = 1 TO 5
110 PRINT Z, 1/Z : NEXT Z
120 END
```

It is not necessary to type in spaces, except within strings. Basic will automatically put each line in its correct form. Furthermore, most keywords can be abbreviated. For example, P. is used for 'print', and U. for 'using'. Be careful though. R. is 'run' not 'return' and P. is 'print' not 'pause'. Also, a colon is not necessary after the label 'loop' since it is not a Basic statement.

At the end of the source program, press the 'mode' key three times to shift to 'run' mode. ('Run' will now appear.) Begin execution by giving the command:

```
RUN "LOOP" <ENTER>
```

The loop index, Z, and its reciprocal will appear on the display. Press 'enter' and the next step will be displayed. Each time 'enter' is pressed, the program will print the next step. The program can be aborted by pressing the 'on break' key.

Edit the program by shifting the mode to 'pro'. This requires only a single press of the key. Give the command:

```
LIST "LOOP" or
L. "LOOP"
```

Line 100 of the program will be displayed. Press the down-arrow key to display line 110. Move the cursor to the letter P in the word 'print' by pressing the right-arrow key. Shift the remainder of the line to the right two spaces by pressing the shift key and the right-arrow key twice in sequence. Type the characters:

```
PA.
```

Finish the line as usual by pressing 'enter'. Be sure to press 'enter' after each alteration or the new line won't actually be saved.

The computer will reformat line 110 to:

```
110:PAUSE Z,1/Z:NEXT Z
```

A colon is automatically inserted after the line number of the keyword 'pause' is spelled out. Shift to 'run' and rerun the program:

```
R. "LOOP"
```

This time, the program will automatically step through the loop, briefly displaying each line of output.

So far, so good. But there is a potential problem with 'print' or 'pause'. This is the only form that allows a mathematical operation to be included. For this reason, it is best to substitute a variable such as Y in place of 1/Z. Alter the program to:

```
100 "LOOP" FOR Z = 1 TO 5 :
  Y = 1/Z
110 PRINT Z, Y : NEXT Z
120 END
```

The new version should run exactly as before.

We will now explore other forms of the 'print' statement. Notice that the following forms, usually acceptable in Basic, *cannot* be used.

```
PRINT Z,Y,    (final comma)
PRINT Z,Y,X (more than 2 items)
PRINT Z;Y     (semicolon
                 separator)
PRINT Z,Y;    (final semicolon)
PRINT Z;Y;    (two semicolons)
```

Strings, however, can be included:

```
110 PRINT "Z = ";Z;"Y = ";Y or
110 USING "Z = ";Z;"Y = ";Y
```

In this form, semicolons rather than commas must be used to separate the items in the list. Add the strings "Z = " and "Y = " to line 110 so it looks like one of the above lines.

Watch those numbers

The printed value can be formatted with the 'using' statement:

```
105 USING "##"
110 PAUSE "Z = ";Z;"Y = ";
  USING "##.###";Y
```

Notice that, unlike regular Basic, the 'using' is separate from 'print'. The 'using' statement can be placed anywhere. One potential problem is that, if the number to be printed is too large, computation stops and a syntax error is displayed. Space must be allocated for the sign of a number, even if the number is positive. This can be demonstrated by changing the loop limit to 10:

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```
100 "LOOP" FOR Z =1 TO 10
  :Y = 1/Z
```

Make the change and rerun. The program runs properly through the first nine passes. On the tenth, a syntax error is displayed. This occurs because the loop index, I, is too large for the 'using' field. The problem can be solved by increasing the field width to 3:

```
105 USING "###"
```

Another potential problem is that variables are not cleared when the 'run' is given. A 'using' command from a previous program will remain in effect unless specifically canceled with either a 'clear' or 'using' command.

The 'input' command can also cause trouble. The forms:

```
INPUT X
INPUT X,Y and
INPUT "X:";X,"Y:":Y
```

are all acceptable. Notice that there is a comma after the variable X in the second and third examples. While the following form is similar to those above, it cannot be used because there is a semicolon rather than a comma after the variable X:

```
INPUT "X:";X;"Y:";Y
```

Since 'print' cannot end with a comma or semicolon, it is not possible to print a variable as a prompt for input:

```
PRINT I;":";
INPUT Y
```

Input data can be in almost any form: a constant, a variable, or a mathematical expression. Thus, if the user is asked to enter a value for the variable B, it is possible to enter any of the following:

```
35
A
1/7
SIN 45
```

Suppose that a tutorial program asks the user some mathematical questions such as:

```
4 + 7
```

The user can simply repeat the question as the answer:

```
4 + 7
```

The TRS80 will calculate the result and declare it correct.

Since more and more service stations are selling fuel in metric units, the following Basic program can be used to convert the total price and the number of liters into the equivalent price and number of gallons. Set the mode to 'pro' and enter listing 1. Change the mode to 'reserve' and press 'shift-F'. Enter the line:

```
RUN "FUEL"
```

Finish the entry by pressing 'enter'.

Try out the program by shifting the mode to 'run'. Press 'shift-F' then press 'enter'. The program will ask for the cost. Answer with the total price in dollars. The program then asks for liters. Answer the number of liters. The display will show the number of gallons purchased and the corresponding price per gallon. Pressing 'enter' will rerun the program.

A common operation in scientific and business calculations is fitting a straight line through a set of points. This is called linear regression. The coefficients A and B for the equation:

```
Y = A + B * X
```

are determined by the operation. A is the Y-axis intercept and B is the slope of the line.

With the program in listing 2, the pocket computer can find the values of A and B for a set of data. In addition, the program determines the correlation coefficient C. This value, which ranges from −1 to

Listing 1. A program to convert liters to gallons.

```
450 "FUEL" INPUT "COST:";C,"LITERS:";L
460 G=L/3.785 : B=C/G : USING "###.#"
470 PRINT G;" GAL,$"; USING "##.##";B;"/GAL"
480 GOTO "FUEL"
```

Listing 2. A program to fit a straight line.

```
900 "LIN" CLEAR
910 INPUT "X:";X : IF X>E98 GOTO 940
920 INPUT "Y:";Y : N=N+1 : H=H+X*Y : G=G+Y*Y
930 D = D+X : E = E+Y : F = F+X*X : GOTO 910
940 K = F- D*D/N : L = H - D*E/N
950 M = G-E*E/N : B = L/K
960 A = (E - B*D)/N : C = L/SQR(K*M)
970 PRINT USING "##.###^";"CONST=";A
980 PRINT "SLOPE=";B
990 PRINT USING "##.###"; "COR=";C : GOTO "LIN"
```

+1, tells how well the straight line describes the original data. A value close to zero means that the fit is useless, whereas a value close to 1 means that the fit is good. A positive sign means that Y increases as X increases, whereas a minus sign means that Y decreases as X increases.

Enter the program into your computer and execute it by commanding:

```
RUN "LIN"
```

Give the first value of X then press 'return'. Enter the corresponding value of Y and press 'return'. Continue in this way entering the X and Y pairs. After all the data has been entered, give a value of 1E99 for X (where E is the exponent key). This indicates that the end of the data automatically starts the computation. The value of A, the intercept is printed first. Press 'return' and the value of the slope is displayed. Finally, press 'return' and the correlation coefficient is shown.

The intercept and the slope can both be displayed on the same line, rather than sequentially, by omitting the explanatory text. Delete line 980 and change line 970 to:

```
970 PRINT A,B
```

Alternately, if the values are going to be in the range of 1 to 100, smaller print fields can be used:

```
970 PRINT USING
    "####.#";"A =";A;",B =";B
```

If you become distracted while entering the data, push 'on break'. Then press N and 'return'. This will print the number of points you have entered so far. Type 'cont' and 'return'; a question mark will appear. Continue entering the X and Y data.

Additional space can be gained at the expense of program clarity. The multiplication symbol, *, is optional between two variables. Thus all asterisks shown in listing 2 can actually be deleted. For example, line 920 can be written as:

```
920 INPUT "Y:";Y : N=N+1 :
    H=H+XY : G=G+YY
```

This frees up one step for each asterisk.

The pocket micro can retain many independent programs in its memory, even when the display is turned off. But eventually, the four wristwatch-type batteries will need replacement whereupon all user written programs will be lost.

There is another way this can happen. Once during an edit session, the keyboard locked up. The display stayed on, but the computer would not respond to any key. With a regular computer, one presses the reset button. A call to Radio Shack revealed that a reset was indeed necessary. Pushing a ballpoint pen into a hole in the back reset the computer. Unfortunately, all of the stored programs were gone. It took an hour to reenter the programs, step-by-step and another 30 minutes to find the typing errors. The lesson is this: Keep a written copy of the programs somewhere. Better yet, get the tape recorder interface so that programs can be easily reloaded.

The TRS80 pocket computer is truly an amazing device and we will likely see more accessories in the future. Two useful additions would be a printer and an RS232 interface. The latter would allow connection to a larger computer.

The portable micro can be taken to a customer's establishment, gather data and transfer it to a central computer back at the main office.

The future looks very interesting indeed. □

Population Projection Program For Small Business Market Research

by William E. Mihalo

One type of information that can make or break any business is growth or decline in population in the surrounding area. This information can help an individual select a new business site near a desired market, and helps established businesses anticipate future market changes.

Although large businesses invest heavily in elaborate market studies, small businesses do not have the resources. Consequently, many small businessmen are forced to operate with skimpy information about changes in the population. Even though the Census Bureau publishes projection information, it is rarely in a format that gives detailed descriptions of a geographic area pertinent for a small business.

The program described here is unusual in that it provides an individual with a population projection and detailed demographics of a geographic area targeted by a user. The output from this program includes:

- the age-sex breakdown for each year the population is projected
- a migration estimate for each year the population is projected
- annual migration rates
- summary tables by sex following a population projection sequence
- an indication of the percent change for each sex in each age group following a projection sequence
- the ability to save some output from each population projection sequence on the medium of the user's choice

The output from this program can also be used as a basis for the computation of other measures of a market. For example, it is a simple process to take the output from this program and compute the family income characteristics of the population.

The demographic model is based on a simple equation:

$$P_1 = P_0 - \text{DEATHS} + \text{BIRTHS} + \text{MIGRATION}$$

Where P_0 is the size of the unprojected population and P_1 is the projected size of the population.

This is sometimes called the population balancing equation. All projection techniques are based on computing the various components that go into it.

The first thing computed is the amount of migration and the migration rates associated with a particular population. Migration estimates can be obtained by comparing two populations. Generally, a base population is compared with counts of the number of people who lived in the area 10 years earlier.

Suppose I have 1970 census data that I wish to project to find the migration pattern in a given area. I would obtain the 1960 population count for the area, "age" and "survive" the population 10 years using a set of 1960-1970 national census survival rates, and obtain an estimate of the 1970 population.

The level of migration is found by subtracting the 1970 estimated population from the 1970 census count for the area. The 10-year migration rate for the population is computed by dividing the 1970 census count by the 1970 population estimate and subtracting the number from 1. Annual migration rates are com-

puted by an additional step that converts the 10-year migration rate to a one-year rate.

When run, the user should be cautioned about two things: First, don't be alarmed when the 1960 population count does not appear to have any relationship to the 1970 migration estimates in the same row. Remember that the 1970 population has aged 10 years, and estimates for it are moved two rows down in a migration table.

Second, the model assumes that the total number of in-migrants to an area will, at a maximum, double the population over a 10-year period. This means that the largest annual rate of in-migration to an area will never exceed 0.0717735 (which is 2 to the power of 0.10 minus 1.0).

Computing out-migration

Similarly, it is assumed that the total number of out-migrants to an area will never reduce the total population by more than one-half for a 10-year period. This means that the smallest rate of out-migration from an area will be −0.0669701 (which is 0.50 to the power of 0.10 minus 1) on an annual basis.

If a user does not like these limits, he can specify his own by changing the appropriate values in lines 2780, 2790, 2810, and 2820.

Once the migration rates are computed, it is a simple step to project the population. The base year population is "survived" one year the amount of net migration is added to this estimate giving the user a final population estimate that is displayed in the last part of the program.

When the population is aged in the last part of the program, a different technique is used than in the migration estimate. A rectangular method is used to age people and the population "flows" through an age interval.

For example, in the 30-34 age interval, 20% of the people are subtracted as they move into the 35-39 age group. At the same time, 20% of the people 25-29 are added to the 30-34 interval. This happens for each year in a population projection sequence. Since a different method for aging people in the final projection phase of the program is used, the same age interval at one point in time can be directly compared to the same age interval at a different point in time.

The program is written in Applesoft and occupies about 28K of memory (including DOS) in an Apple system. The program can be squeezed into a 16K Applesoft ROM system by deleting the instructions, REM statements, and the DOS subroutines. This program can also be used on other computer systems with little modification.

The input command menu is entered shortly after starting the program. This menu provides the user with a variety of options:

(1) ENTER DATA FROM KEYBOARD

This command instructs the computer to receive raw data from the keyboard. The data must be entered by using 5-year age intervals (5-year age intervals are the most common way of displaying demographic data). The program will first ask for the data for females from the 1960 census or similar source (1970 data will be requested if a user has access to the new 1980 census data).

After this data, information about males for 1960 or 1970 (again, depending on whether or not a user has access to the 1980 census data) is entered.

If you make a mistake when entering data, make a note of it and continue to enter the remaining data. Errors can be corrected with an editor from the input command menu.

Similarly, a user must enter the data for females from the 1970 (or 1980, if available) census and the process of data entry continues with males.

(2) ENTER DATA FROM CASSETTE TAPE

If you are using an Apple II, previously stored data will be recalled by this command.

(3) ENTER DATA FROM DISK

Make sure that you enter the correct file name and have the correct disk inserted in the drive for this command.

(4) VERIFY, SAVE OR EDIT RAW DATA

This command will take you to the data correction command menu. The available commands are: 1) display data only; 2) display and correct data (the editor); 3) save data on tape; 4) save data on disk; 5) transmit data via comm card (enables a user to transmit data to another installation); and 6) return to input command menu.

(5) INITIATE PROJECTION OF DATA

This will take the user to the migration estimation menu. Please note that a variable (SW) will lock out a user from input commands 4 or 5 until commands 1, 2, or 3 are executed.

The migration estimation menu will be discussed in greater detail in another section.

(6) ABORT PROGRAM

Stops execution of the program. This is to exit the program without going through any of the projection steps.

Migration Estimation Menu

This menu provides a user with six possible commands.

(1) DISPLAY MIGRATION RATES

This shows the migration rates for each sex. If a total population of less than approximately 100,000 people is used, all data will be properly formatted. If a larger population is used, a statement in the output formatting subroutine (which begins in line 8010) will override variable S (which contains the total number of columns to be printed by the subroutine) and output may not be properly formatted.

Formatting without a printer

If a user is working with a printer and can output a line greater than 40 columns, the S parameter should be reset to accommodate these changes. The S parameter is initialized just before a call to the output formatting subroutine.

If a user does not have access to a printer but still wishes to maintain correctly formatted output, he should modify his input file by dividing by a constant such as 10, 100, or 1000. Dividing by multiples of 10 is a common way of handling large numbers by people who work with population counts. Although the migration rates are not affected, the user should be aware that subsequent tables will also be in multiples of 10.

(2) SAVE MIGRATION RATES ON TAPE

This will 'store' array MR on tape. Although the array cannot be directly 'recalled' by this program, it is useful if a user wishes to write additional programs.

(3) SAVE MIGRATION RATES ON DISK

This will write array MR on disk as a sequential file.

(4) TRANSMIT RATES VIA COMM CARD

If this command is activated, the program will transmit array MR to another installation.

(5) ENTER LAST PHASE OF PROJECTION

In commands 1 through 4, array MR is always initialized. There are some situations where a user may wish to apply the migration pattern of one geographic area to another to compensate for changes in census tract boundaries from one census to the next. Some may also apply the migration rates of one area to another in order to understand how things change.

City-by-city comparisons

Suppose you wanted to see how Gary, Indiana would look in 1985 when applied to the migration rates of Hammond.

This would be accomplished by starting the program, entering the data for Hammond, proceeding to the migration estimation menu, and running commands 1, 2, 3, or 4. Afterwards, command 6 ('return to input command menu') is entered and the user is back at the input menu. At this point, the user enters the data for Gary and proceeds to the migration estimation menu by executing input command 5. Once he reaches the migration estimation menu, command 5 is invoked and the user enters the last step in the projection process. In effect, command 5 never modifies the migration rates that are in array MR.

When command 5 is run, the system asks for the number of years the population will be projected. At present, the program will advance a maximum of 15 years from the base census year. The accuracy of the program deteriorates after about 15 years (a user can go beyond a 15-year limit by changing the parameter for the first dimension in array XE at line 510, and by modifying line 3390).

Next, the user is asked if he wants a table for each year the population is projected. The user has the option of viewing the annual and summary tables, examining the summary tables only, and instructing the program to save the contents of array X1 on tape or disk.

Array X1 is the same variable initialized by reading data from tape or disk from the input command menu. When array X1 is first initialized, the 1960 and 1970 (or 1970 and 1980) data is stored in this location. However, once a projection sequence is completed, the data for the base year (1970 or 1980) and the final projected year are copied to tape or disk if the user requests it.

If 1980 census data is used in this program, the user must enter a new set of national census survival rates for 1970 to 1980. These rates are stored in 'data' statements in lines 3950 through 4020. The user must enter survival rates first for women and then for men for each 5-year age group. These should be from the "all classes" section of a table released by the Census Bureau.

Before entering this data, the user should examine page 3 of the Current Population Reports Series (P-23 No. 41, April 1972) for a better understanding of the survival rate structure. This government document is available at many libraries that house census data. The national census survival rates in this program are from the "all classes" section in the 1972 document. □

Program on page 128

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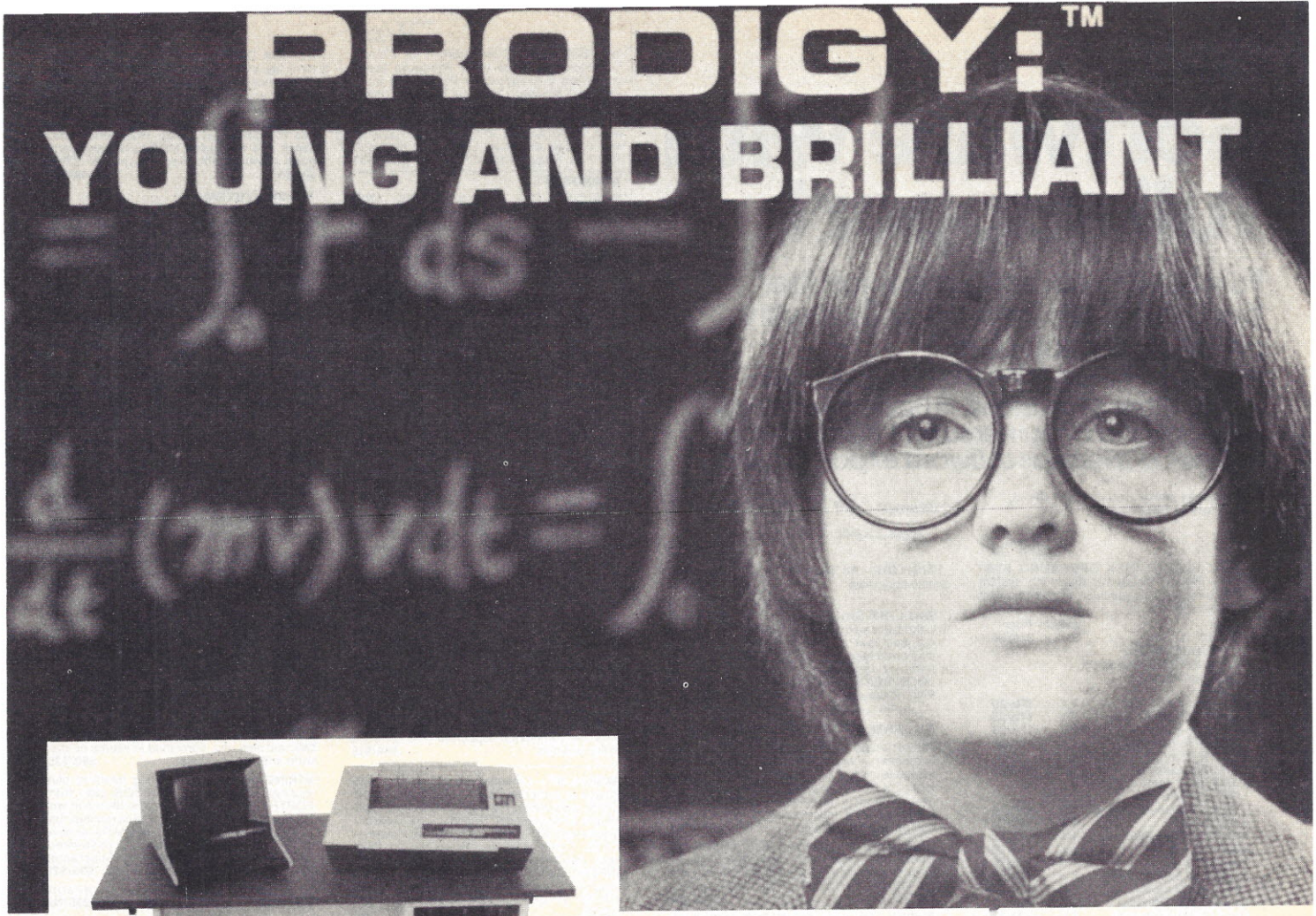

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*Software consists of the operating system, text editor, assembler, debugger and other utilities for file management and system maintenance. Complete set of Digital Research's documentation and additional implementation notes included. Systems marked * and ** include firmware on 2708 and 2716. Systems marked + include 5440 media charge. Systems marked Ⓜ require the special Ⓜ versions of software in this catalog. ◇ includes hardware addition to allow our standard versions of software to run under it.*

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☐ **PASCAL/Z**—Z80 native code PASCAL com- ① piler. Produces optimized, ROMable re-entrant ② code. All interfacing to CP/M is through the support library. The package includes compiler, relocating assembler and linker, and source for all library modules. Variant records, strings and direct I/O are supported. Requires 56K CP/M ..... **$395/$25**

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☐ **CBASIC-2** Disk Extended BASIC—Non- Ⓜ interactive BASIC with pseudo-code compiler and run-time interpreter. Supports full file control, chaining, integer and extended precision variables, etc. Versions of CRUN for CP/M versions 1.4 and 2.x included on disk. . **$120/$15**

MICRO FOCUS

☐ **STANDARD CIS COBOL**—ANSI '74 COBOL Ⓛ standard compiler fully validated by U.S. Navy tests to ANSI level 1. Supports many features to level 2 including dynamic loading of COBOL modules and a full ISAM file facility. Also, program segmentation, interactive debug and powerful interactive extensions to support protected and unprotected CRT screen formatting from COBOL programs used with any dumb terminal ..... **$850/$50**

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☐ **KBASIC**—Microsoft Disk Extended BASIC Ⓛ version 4.51 integrated with KISS Multi-Keyed Index Sequential and Direct Access file management as 9 additional BASIC commands. KISS included as relocatable modules linkable to FORTRAN-80, COBOL-80, and BASIC COMPILER. Specify CP/M version 1.4 or 2.x when ordering. Requires 48K CP/M **$585/$45** To licensed users of Microsoft BASIC-80 (MBASIC) ..... **$435/$45**

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☐ **BASIC UTILITY DISK**—Consists of: (1) Ⓜ CRUNCH-14— Compacting utility to reduce the size and increase the speed of programs in Microsoft BASIC 4.51, BASIC-80 and TRS-80 BASIC. (2) DPFUN—Double precision subroutines for computing nineteen transcendental functions including square root, natural log, log base 10, sine, arc sine, hyperbolic sine, hyperbolic arc sine, etc. Furnished in source on diskette and documentation ..... **$50/$35**

☐ **STRING/80**—Character string handling plus routines for direct CP/M BDOS calls from FORTRAN and other compatible Microsoft languages. The utility library contains routines that enable programs to chain to a COM file, retrieve command line parameters and search file directories with full wild card facilities. Supplied as linkable modules in Microsoft format. **$95/$20**

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☐ **BSTAM**—Utility to link one computer to another Ⓜ also equipped with BSTAM. Allows file transfers at full data speed (no conversion to hex), with CRC block control check for very reliable error detection and automatic retry. We use it! It's great! Full wildcard expansion to send *.COM, etc. 9600 baud with wire. 300 baud with phone connection. **Both** ends need one. Standard and Ⓜ versions can talk to one another. This software requires a knowledge of assembler language for installation. . . . . **$150/$10**

☐ **BSTMS**—Intelligent terminal program for Ⓜ CP/M systems. Permits communication between micros and mainframes. Sends character data files to remote computers under complete control. System can record character data sent from remote computer systems and data banks. Includes programs to EXPAND and COMPRESS binary files for transmission. This software requires a knowledge of assembler language for installation. . . . . **$200/$25**

☐ **WHATSIT?***—Interactive data-base system using associative tags to retrieve information by subject. Hashing and random access used for fast response. Requires CBASIC-2 . **$175/$25**

☐ **SELECTOR III-C2**—Data Base Processor to † create and maintain multi-key data bases. Ⓜ Prints formatted sorted reports with numerical summaries or mailing labels. Comes with sample applications, including Sales Activity, Inventory, Payables, Receivables, Check Register, and Client/Patient Appointments, etc. Requires CBASIC-2. Supplied in source . . . . . **$295/$20**

☐ **GLECTOR**—General Ledger option to SELECTOR III-C2. Interactive system provides for customized COA. Unique chart of transaction types insure proper double entry bookkeeping. Generates balance sheets, P&L statements and journals. Two year record allows for statement of changes in financial position report. Supplied in source. Requires SELECTOR III-C2. CBASIC-2 and 56K system. . . . . **$350/$25**

DMA

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☐ **TEXTWRITER III**—Text formatter to justify and Ⓜ paginate letters and other documents. Special features include insertion of text during execution from other disk files or console, permitting recipe documents to be created from linked fragments on other files. Has facilities for sorted index, table of contents and footnote insertions. Ideal for contracts, manuals, etc. Now compatible with Electric Pencil* and Word-Star prepared files . . . . . **$125/$20**

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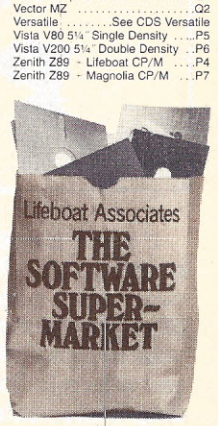

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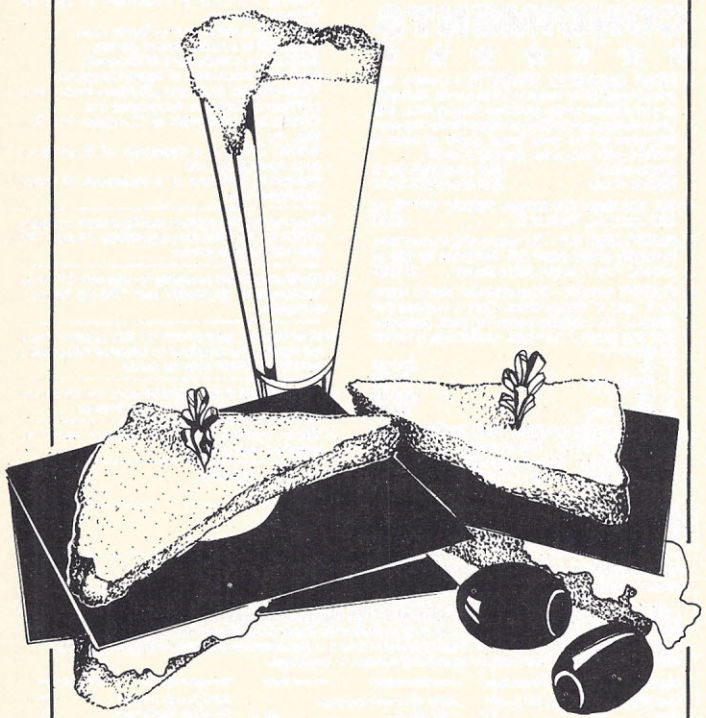

Generalized Menu Program

by Gene Embry

If you are writing a lot of programs, you probably get bored typing in the same data over and over. This article describes a generalized menu program that will quickly allow you to start developing the major subroutines of your program. All you need to do is decide what to do and where to do it. Then enter the whats and wheres in data statements, and you are ready to develop the various routines.

You probably plan your programs correctly in the beginning. I, however, usually forget one or two major items that need to be added after I am almost finished writing the program. Using the routine way of writing a menu-driven program, it was time consuming to add or delete to the menu. Several lines of code would need to be changed to add to the printing of the menu plus testing to verify the selection was within certain limits. If you decide to adopt this technique, a single line of code will permit modification of the menu. Everything else will be taken care of automatically.

The complete program is shown in the listing. The first ten lines are reserved for program identification. I always make line 1 the disk file name used to store (save) the program. This helps avoid two or three identical programs on the same disk with the only difference being their names.

Setting up a subroutine

Start off by calling a subroutine (9800) in line 10. All assignments of constants and variables are made during this section. In a normal program where data files are used, we open them, set the date and do a normal startup routine. The statement 'line = 0' disables Basic's automatic generation of a carriage return when the print position exceeds 25% of 64.

This permits total line control of the terminal. Lines 9820 to 9826 count the number of items in this program (T). We then dimension two arrays, N$ and N, equal to the number of items. Reset the data pointer and fill up our two arrays.

After returning, we display our menu in lines 100 to 199. The 'home' command clears the screen and positions the cursor to the upper left corner. The variable A is used to slide the name of the menu (N$) either right or left. It may be adjusted to any value positive or negative. The actual printing of the menu is done in lines 120 to 180.

The function 'imod(N,2)' returns the integer remainder of dividing N by 2. Thus, on even values of X, we reset N to zero, and generate a carriage return and line feed (line 142). If more than two columns per line are needed, change the value from 2 in line 142 to the proper value.

Lines 200 to 299 are used to set the user's selection. The testing of the input is in lines 230 and 240. A negative number will cause the menu to be displayed again. Any number greater than one less than the number of items on the menu will terminate the program. To create an endless loop with no escape, change '900' in line 240 to '100'.

If a proper value is selected, a call to the major subroutine is made in line 280. Following return, the menu is again displayed. The tasks to be performed are, of course, up to you. They might be, for example, 'add' to a data file. 'modify', 'delete', 'search' or 'print'.

I use this technique in large systems where one out of 20 or 30 programs needs to be selected. This is done by changing the line number in the data statement to the actual program name. The second array (see line 9830) will then be changed to a string array. Finally, the 'gosub' in line 280 will be changed to 'chain'. Thus, with very little modification, you have two very useful generalized, menu-driven programs: one to call subroutines and the other to call other programs. □

Program on page 134

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TRS-80 Program Recovery

by J. Kovacic

You spent hours perfecting a lengthy Basic program. You start your cassette deck and lean back in your chair to enjoy the fruits of your labor. All of a sudden something on the screen catches your eye: two asterisks have appeared in the upper-right corner of the screen. There, right in front of your nose, as if mocking you, is displayed your last command: 'CLoad X'. "But I meant CSave."

All is not lost.

With quick action, recovery can be made. Stop the cassette deck, eject the tape, then press the 'reset'. If you try 'list' you probably will be very discouraged as nothing will appear; your program has apparently been lost. What has happened is that, in preparation for loading the tape, the machine has performed 'new'. Luckily for all of us error-prone humans, 'new' merely resets certain pointers; it does not erase the program.

The last two paragraphs have the needed "fix." However we take this opportunity to explain a little of how the TRS-80 operates.

A Basic program is stored in RAM as a linked list. Each line has the following format.

PTR LINE# text of line 0 ,

where PTR is the 2-byte pointer to (i.e., address of) the next line and 'line#' is the 2-byte line number. These numbers are in hex (base 16) and are stored "backwards," with least significant byte first. For example, suppose that we have a level II non-disk system and that our program is:

```
10 THIS
20 IS A
30 PROGRAM
```

At memory 42E9 and following, we would find (all numbers are hex):

```
42E9:  F2 42 0A 00 54 48 49 53 00
42F2:  FB 42 14 00 49 53 20 41 00
42FB:  07 43 1E 00 50 52 4F 47 52 41 4D 00
4307:  ...
```

42F2 is the address of the next line, 000A is the current line number (10 in decimal) 54 48 49 53 is 'this' in Ascii, etc.

You can verify this by using the Basic 'peek' function. Of course, the numbers will then be decimal:

```
17129:  242 66 10 0 84 72 73 83 0
17138:  251 66 20 0 73 83 32 65 0
17147:  7 67 30 0 80 82 79 71 82 65 77 0
17159:  ...
```

If you 'poke' around in your stored program, you find that keywords (end, for, etc.) have been converted to a 1-byte "token." A list of the keywords and their tokens is given in figure 1.

In the above, we have assumed that the text storage area starts at 42E9 (hex) or 17129 (decimal). This is normally true with a non-disk system. With disk-based systems, the program storage area varies, depending on the number of files requested. The actual start address of the program storage area is stored in 40A4,5 (16548,9 in decimal). Thus, to find out where your program text storage area really starts, perform

```
> ? PEEK (16548) + PEEK (16549) * 256
```

The answer will, of course, be in decimal.

How does the machine know where the program ends? In two ways. Two bytes of 0 are stored after the last line of the text. In the example above, memories 4307 and 4308 (17159,60 in decimal) will both be zero. This EOF (end-of-file) is sufficient for some purposes. For example, the 'list' command looks for EOF to decide when to stop.

However the 'run' command needs to know where the text ends without having to actually read through the entire text. This is because variables are stored at the end of the text. Thus TRS-80 maintains the address of the end of the text in memory at 40F9,A (16633,4 in decimal). This really is the address of the start of variable storage, i.e., the address of the byte after the EOF. In

our example, 40F9,A will contain 4309. The command

```
> ?PEEK (16633) + PEEK (16634) *256
```

should give the decimal answer 17161.

Now that we know how text is stored, we can explain the 'new' command. It merely puts EOF (two bytes of zero) at 42E9,A (or at the address stored in 40A4,5) and loads 40F9,A with 42EB.

It is almost trivial to replace the EOF with the correct address. We explain how to do this in the next paragraph. However, it is not so easy to find the correct number to store in 40F9,A. We finally do this with a 13 (decimal) byte machine language program that we 'poke' into memory. It is somewhat tedious to do this, so the author solicits suggestions for an easier method. If only the EOF is removed, the 'list' command works fine, but 'edit', 'delete', 'run' (and possibly other commands) will bomb. Our machine language program corrects both 40F9,A and EOF. However we still present the EOF correction. Why? Because we think it is cute.

To correct the EOF: First find out where the program storage area really starts. With a non-disk system, these numbers can be determined once and then be recorded for posterity. With a disk-based system, the numbers

keyword	token (hex)	token (decimal)	keyword	token (hex)	token (decimal)	keyword	token (hex)	token (decimal)
END	80	128	NAME	A9	169	OR	D3	211
FOR	81	129	KILL	AA	170	>	D4	212
RESET	82	130	LSET	AB	171	=	D5	213
SET	83	131	RSET	AC	172	<	D6	214
CLS	84	132	SAVE	AD	173	SGN	D7	215
CMD	85	133	SYSTEM	AE	174	INT	D8	216
RANDOM	86	134	LPRINT	AF	175	ABS	D9	217
NEXT	87	135	DEF	B0	176	FRE	DA	218
DATA	88	136	POKE	B1	177	INP	DB	219
INPUT	89	137	PRINT	B2	178	POS	DC	220
DIM	8A	138	CONT	B3	179	SQR	DD	221
READ	8B	139	LIST	B4	180	RND	DE	222
LST	8C	140	LLIST	B5	181	LOG	DF	223
GOTO	8D	141	DELETE	B6	182	EXP	E0	224
RUN	8E	142	AUTO	B7	183	COS	E1	225
IF	8F	143	CLEAR	B8	184	SIN	E2	226
RESTORE	90	144	CLOAD	B9	185	TAN	E3	227
GOSUB	91	145	CSAVE	BA	186	ATN	E4	228
RETURN	92	146	NEW	BB	187	PEEK	E5	229
REM	93	147	TAB(	BC	188	CVI	E6	230
STOP	94	148	TO	BD	189	CVS	E7	231
ELSE	95	149	FN	BE	190	CVD	E8	232
TRON	96	150	USING	BF	191	EOF	E9	233
TROFF	97	151	VARPTR	C0	192	LOC	EA	234
DEFSTR	98	152	USR	C1	193	LOF	EB	235
DEFINT	99	153	ERL	C2	194	MKI$	EC	236
DEFSNG	9A	154	ERR	C3	195	MKS$	ED	237
DEFDBL	9B	155	STRING$	C4	196	MKD$	EE	238
LINE	9C	156	INSTR	C5	197	CINT	EF	239
EDIT	9D	157	POINT	C6	198	CSNG	F0	240
ERROR	9E	158	TIME$	C7	199	CDBL	F1	241
RESUME	9F	159	MEM	C8	200	FIX	F2	242
OUT	A0	160	INKEY$	C9	201	LEN	F3	243
ON	A1	161	THEN	CA	202	STR$	F4	244
OPEN	A2	162	NOT	CB	203	VAL	F5	245
FIELD	A3	163	STEP	CC	204	ASC	F6	246
GET	A4	164	+	CD	205	CHR$	F7	247
PUT	A5	165	-	CE	206	LEFT$	F8	248
CLOSE	A6	166	*	CF	207	RIGHT$	F9	249
LOAD	A7	167	/	D0	208	MID$	FA	250
MERGE	A8	168	^	D1	209	'	FB	251
			AND	D2	210			

Figure 1. Key words and their tokens.

may vary from time to time (depending on the number of files requested, whether 'verify' is in effect, etc.).

```
>?PEEK (16548)
   a      (usually 233)
>?PEEK (16549)
   b      (usually 66)
>? a + b * 256
   c      (usually 17129)
```

Next, 'poke' this address into itself.

```
> POKE c,a
> POKE c+1,b
```

The program storage area will now look like:

```
42E9: E9 42 LINE# text 0
```

Our program now consists of an infinite number of copies of the original first line. 'List' it and hit the 'break' key to exit the infinite cycle. Count the number of characters in the line, including spaces, but excluding the line number and the single space following the line number. Add 5, (2 for the pointer, 2 for the line number, and 1 for good luck - the zero at the end of the text) and call the result d. We now add d to ba using base 256 arithmetic. Add a + d and call the result a. If this is larger than or equal to 256, subtract 256 from a and add 1 to b (i.e., perform the 'carry'). Next

```
> POKE c,a
> POKE c+1,b (omit this step if b is unchanged)
```

The EOF has been corrected. You may 'list' the file to verify this. However do not attempt to 'edit', 'delete' or 'run'.

Unfortunately this only solves half the problem. (Those readers unfamiliar with machine language can skip the next two paragraphs and go directly to the last two paragraphs where the "fix" is presented.)

In machine language, it is easy to write a program to recover lost files, primarily because routines exist in ROM to aid the recovery. There is a routing (at 1AF8) that adjusts the PTR portion of the entire stored text. The routine merely requires that the PTR portion of each line be non-zero. It adjusts until it finds the EOF (two bytes of zero). On exit, HL points to the last byte of the EOF. Thus we merely 'inc hl' and store the result in 40F9,A. We should then perform 'clear' (at 1B5D) to reset all the other pointers. Lo and behold at 1B59 we find the code:

```
1B59: 23          INC HL
      22 F9 40 LD (40F9H),HL
1B5D:             CLEAR
```

(This is a perfect counter example to Murphy's Law.) Thus our machine language "fix" is merely:

```
2A A4 40 LD HL,(40A4H) ;find start of text storage
                         area
74       LD (HL),H     ;put something non-zero
                         into PTR
CD F8 1A CALL 1AF8H    ;adjust all PTRs
CD 59 1B CALL 1B59H    ;fix (40F9H), (40FAH),
                         perform CLEAR
C3 19 1A JP  1A19H     ;to READY prompt
```

Note that this program will work whether or not a disk system is in use.

Where should we put this routine? We would like to have its placement be independent of memory size, so low memory is dictated. The output buffer (4130 to

4150) seems to be a good place. The main purpose of this buffer is to convert numbers from hex to decimal Ascii for displaying. As our program has no need to display numbers, we shall store the program there. Because decimal numbers are easier to 'poke', we make that conversion and then 'poke' it in one byte at a time.

To recover a program lost by the 'new' command, perform the following steps. The effect is to 'poke' the machine language program given above into memory and then execute it. This recovery works equally well on non-disk or on disk-based systems.

```
> POKE 16688, 42
> POKE 16689, 164
> POKE 16690, 64
> POKE 16691, 116
> POKE 16692, 205
> POKE 16693, 248
> POKE 16694, 26
> POKE 16695, 205
> POKE 16696, 89
> POKE 16697, 27
> POKE 16698, 195
> POKE 16699, 25
> POKE 16700, 26
> SYSTEM
*? /16688
```

You will be returned to 'ready', with your old program completely restored. Unfortunately the author's usual trick is to press the on/off button while intending to press 'reset'. If any reader has a ''fix'', author will be eternally grateful. □

Software Review

Microsoft's 8086 Cross Assembler and Basic

Tested on the new Godbout dual processor

by Alan R. Miller

The popular microcomputers such as the 8080, 8085, Z-80, 6800, and 6502 are similarly organized. They utilize an 8-bit data bus and a 16-bit address bus. Input and output are performed through 8-bit data ports. Arithmetic operations are limited to addition and subtraction. Consequently, multiplication must be performed by a combination of adding and shifting. Conversely, division is performed by subtraction and shifting.

Minicomputers, by contrast, typically have a 16-bit data bus and a 16-, 20- or 24-bit address bus. Input and output can be performed to both 8-bit and 16-bit ports, and the minicomputer instruction set includes multiplication and division.

The 8080 CPU was originally mated to the S-100 bus by MITS. It typically runs at a speed of 2 MHz. The Z-80 CPU, which is upward (software) compatible with the 8080, is also available for the S-100 bus. It usually runs at 4 MHz, but a newer version, the Z-80B, can run as fast as 6 MHz. The 8085 CPU is also software compatible with the 8080; it can run at 5 MHz.

The Texas Instruments 9900 minicomputer was one of the first 16-bit CPUs to become available for the S-100 bus. But it is not very popular in this form. Additional 16-bit CPUs are in various stages of development. These include the Intel 8086, the Zilog Z8000, and the Motorola 6800.

Intel produces an interesting variation of the 8086 CPU—a 16-bit CPU that internally can be adapted to an 8-bit data bus structure. The 8088 is a 40-pin integrated circuit that multiplexes the 8 data lines on the lower 8 bits of the 20-bit address bus. Externally, the 8088 bus structure is similar to the Intel 8085 CPU. But the 8088 executes 8086 computer programs.

Because of their similar organization, the 8085 and the 8088 CPU chips have been integrated into a single S-100 dual-processor board by Godbout Electronics (Oakland Airport, P.O. Box 2355, Oakland, CA 94614). Its construction is reminiscent of the early steamships which were provided with sails, or the first jet plane which mounted propellers.

When a computer containing the dual-processor board is turned on, the 8085 CPU is initially in control. Also, whenever the reset line is activated, the 8085 takes control. By this, an 8080 operating system such as CP/M (IA May 80) can be run in the usual manner.

An 8086 program can be loaded from disk into memory. Then the 8088 CPU can be activated so that the 8086 program can be run. If you are using a Z-80 CPU, be sure that the BIOS routines in CP/M use only 8080 instructions. Those Z-80 instructions, uncommon to the 8080, cannot be executed by the 8085 CPU.

The Godbout board has a number of user-selectable options. For example, the 8085 can be run at either 2 or 5 MHz. (The 8088 always runs at 5 MHz.) A wait state can be added after each input or output instruction. The power-on-jump address can be located on any 1K boundary. But there is no Prom on the dual processor board, so a separate Prom card may be necessary to get things started.

The 8088 CPU is activated when the 8085 CPU performs an 'in' instruction on the 8-bit port at address FD hex.

```
DB FD   IN   OFDH   ;8080 code
```

In one configuration, the 8088 CPU begins executing instructions at address '0fff0' hex. A jump to the actual code can be placed at this point. Control is returned to the 8085 CPU when the 8088 CPU executes an 'in' instruction on port FD hex.

```
E4 FD   IN   AL,OFDH   ;8086 code
```

The 8088 has a 20-bit address bus that normally accesses 1 megabyte of memory. But the Godbout board can utilize a 24-bit bus that addresses 16 megabytes of memory. It turns out, however, that the 8088 can only refer to four blocks of 64K memory at one time.

One possible incompatibility problem may occur with the S-100 bus pin 61. This is used for address line A20 on the Godbout board. But the North Star double-density disk-controller board has a jumper to ground this pin. If you have such a disk controller, be sure that bus pin 61 is ungrounded.

The 8086 and 8088 CPUs incorporate 14 registers that each contain 16 bits. Four of these registers are used for general operations. They are designated as the accumulator (AX), the base register (BX), the count register (CX), and the data register (DX). (The X symbol refers to 16-bit extended registers as opposed to 8-bit registers.) These four registers may also be addressed as eight registers of 8-bits each. These are termed AH, AL, BH, BL, CH, CL, DH, and DL.

Four registers are used as index registers or pointers. They are called the stack pointer (SP), the base pointer (BP), the source index (SI), and the destination index (DI).

One 16-bit register is designated as the instruction pointer (IP); it is equivalent to the program counter on the 8080 CPU. Another 16-bit register contains status flags. Finally, there are four segment registers of 16

bits each. These are called the code segment (CS), the data segment (DS), the stack segment (SS), and the extra segment (ES) register. All 14 registers are shown in figure 1.

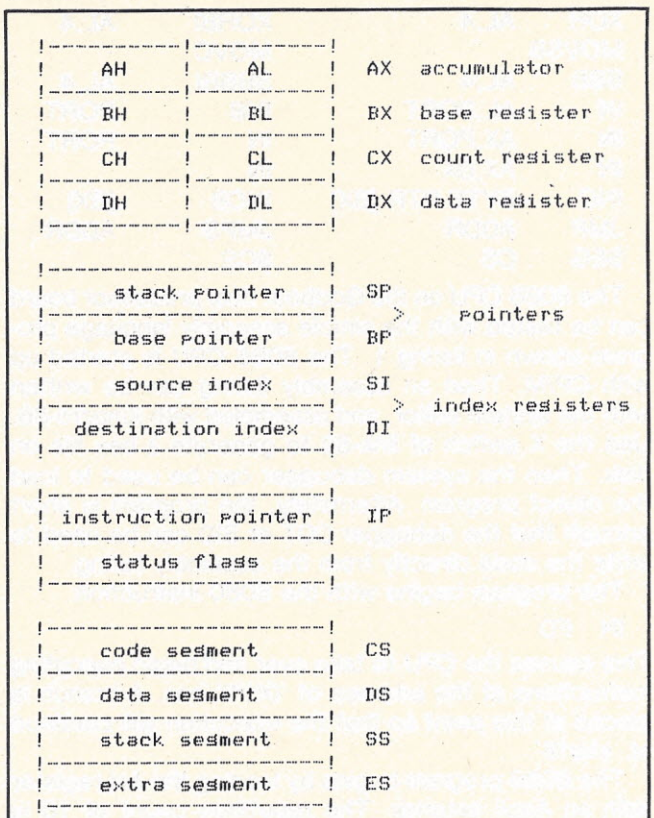


Figure 1. The 16-bit registers of the 8086/8088.

The architecture of the 8086 CPU is ideally suited for higher-level languages such as Pascal. An operation such as:

A[I+3] := B[J+4]

is easily programmed with the index registers.

A cross assembler is a program used on one type of computer to generate binary code and assembly listings for another type of computer. Of course, the resulting program cannot be executed on the host computer.

Microsoft (10800 NE 8th, Suite 819, Bellevue, WA 98004) offers an 8086 cross assembler, Xmacro-86, that can run on an 8080, a Z-80 or an 8085 CPU. It can assemble an 8086 source program to produce a relocatable object program and the corresponding assembly listing and symbol table. Xmacro-86 is the perfect complement to the Godbout 8085/8088 dual processor board.

An 8086 source program can be generated with the CP/M system editor running under control of the 8085 CPU. Then the source program is assembled with the cross assembler. The command could be:

A>XM86 =NEWPROG/L

to assemble a source program named 'Newprog.mac'. This produces a relocatable object program named 'Newprog.rel' and an assembly listing 'Newprog.prn'. The linking loader, link-80, can be used to produce either an executable binary object program in memory or a hex-encoded binary program stored on disk. For example the command:

A>L80 NEWPROG/E

will produce a memory image of the 'rel' file, then return control to CP/M. The number of 256-byte blocks to save is displayed on the console. Give the command:

A>SAVE XX NEWPROG.COM

where XX is the number of blocks to be saved. The program can now be executed by typing:

A>NEW PROG

Alternatively, the command:

A>NEWPROG/N,NEWPROG/X/E

will generate an Ascii-encoded hex file of the object program and save it on the disk. The hex file has the Intel format and can be loaded into memory with the Digital Research debuggers DDT or SID (IA Aug 80).

Xmacro-86 is similar to the regular Microsoft macro assembler Macro-80 (IA Mar 80). The assembler directives (pseudo ops) include 'aseg', 'common', 'cseg', 'db', 'dc', 'ds', 'dseg', 'dw', 'end', 'entry', 'equ', 'include', 'name', 'org', 'page', 'set', 'subttl', 'title', '.comment', '.printx', '.radix', and '.request'. There are the usual conditional-assembly directives 'if', 'else', and 'endif', and the macro directives 'macro', 'endm', 'rept', 'irp', 'irpc', and 'local'.

The 'include' feature is similar to the 'maclib' command of the Digital Research macro assembler. This allows the source listings of frequently used routines to be placed into separate disk files. The assembler will incorporate these separate routines in the final program at assembly time. For example, standard input and output routines can be placed into a disk file named 'inout'. Then, if the line:

INCLUDE INOUT

appears in the assembly source program, the lines from the corresponding disk file will be included. The command 'maclib' may also be used for this purpose.

Nearly all 8080 assemblers incorporate the official Intel mnemonics for the CPU instruction set. By contrast, there are several different versions of Z-80 mnemonics.

The 8086 instruction set is fully described in the Intel publication: *MCS-86 Macro Assembly Language Reference Manual* (1979) (Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051). Additional details are also available in *MCS-86 User's Manual*. The instruction set usage is described by Stephen Morse in *The 8086 Primer* (Hayden, 1980). Adam Osborne also describes the instruction set in *An Introduction to Microcomputers*, volume 2, (loose leaf edition).

Choosing mnemonics

Microsoft has decided not to utilize the Intel mnemonics for Xmacro-86 cross assembler. It chose, instead, a similar set that follows a different approach. Unfortunately, only the Microsoft mnemonics are given in the Xmacro-86 user manual; there is no cross reference to the corresponding Intel mnemonics. This may be confusing for the beginning 8086 assembly language programmer.

Those programmers who are familiar with both the 8080 and the Z-80 instruction sets will recognize a different philosophy in the choice of the mnemonics. Intel distinguishes the type of operation in the 8080 op code mnemonic. For example, the letter I indicates that data will immediately follow the op code:

```
MVI     A,OCH   ;move data (OC) into A
MOV     A,C     ;move register C into A
```

Listing 1. A short program to test the 8085/8088 board.

```
                TITLE       Test 8085/8088 board
                ;
                ; assembled with Xmacro-86 cross assembler
                ;
0012            LSTAT  EQU  12H      ;list status
0013            LDATA  EQU  LSTAT+1  ;list data
0002            OMASK  EQU  2        ;output mask
00FD            SWITCH EQU  0FDH     ;8085/8088
00DB            INPUT  EQU  0DBH     ;8080 IN opcode
                ;
0000            ASEG                 ;absolute code
                ORG    100H
                ;
                ; At location 100 H, 8080 code flips from
                ; 8085 to 8088 and branches to 0FFF0 H
                ;
0100            START5:              ;8080 code
0100 DB FD            DB     INPUT,SWITCH
                ;
                ; The 8088 CPU is now activated and the
                ; CPU branches to address 0FFF0 hex.
                ;
                ; A branch from the restart location 0FFF0
                ; hex causes a return to this location.
                ;
0102            START8:              ;8086 code
0102 B4 2A            MOVBI  AH,'*'  ;symbol to print
0104 B9 000A          MOVI   CX,10   ;number of times
0107 E4 12      OUTT: INB    LSTAT    ;read status
0109 24 02            ANDBI  AL,OMASK ;mask for output
010B 74 FA            JZ     OUTT     ;not ready
010D 8A C4            MOVB   AL,AH    ;get symbol
010F E6 13            OUTB   LDATA    ;send to printer
0111 E2 F4            LOOP   OUTT     ;do until CX = 0
                ;
0113 E4 FD            INB    SWITCH   ;return to 8085
                ;
                ; The next instruction is the beginning of
                ; the 8088 operation.
                ;
                .PHASE 0FFF0H  ;start of 8088 operation
                ;
FFF0 EA 0102          JMP    START8,0
FFF3 0000
                ;
                      END    START5
```

Futhermore, 16-bit extended operations are designated by the letter X in the mnemonic to distinguish them from 8-bit operations:

```
INX     H       ;increment HL register
INR     H       ;increment H register
```

The Zilog Z-80 mnemonics, on the other hand, are more general. The operand is used to define the type of operation. For example:

```
LD      HL,1    ;16-bit load immediate
LD      H,1     ;8-bit load immediate
LD      H,B     ;load B into H
LD      HL,BC   ;load BC into HL
```

The official Intel mnemonics for the 8086 (and 8088) more closely follow the Zilog Z-80 philosophy than the Intel 8080 approach. For example, the 'mov' op code is used for almost all moves:

```
MOV     AX,BX   ;16-bit register move
MOV     AL,BL   ;8-bit register move
MOV     AX,1    ;16-bit immediate move
MOV     AL,1    ;8-bit immediate move
```

Microsoft, however, has used the Intel 8080 approach with Xmacro-86. The letter B or C is included in the op code mnemonic to indicate that the operand refers to an 8-bit byte rather than a 16-bit word. Furthermore, the letter I designates an immediate operand or an indirect reference. For example, the previous four lines in a Xmacro-86 program would look like this:

```
MOV     AX,BX   ;16-bit register move
MOVB    AL,BL   ;8-bit register move
MOVI    AX,1    ;16-bit immediate move
MOVBI   AL,1    ;8-bit immediate move
```

Some of the Xmacro-86 variations are esoteric. For example:

Intel mnemonic		Microsoft mnemonic	
XOR	AL,4	XORBI	AL,4
MOVSB		MOVC	
SBB	AL,4	SBBBI	AL,4
IN	AL,PORT	INB	PORT
IN	AX,PORT	IN	PORT
IN	AX,DX	IN	
INC	BYTE PTR [BX]	INCB	[BX]
JMP	ADDR	JMPS	ADDR
SEG	CS	$CS	

The 8088 CPU on the Godbout dual processor board can be tested with the simple assembly language program shown in listing 1. The 8085 CPU is started up with CP/M. Then an assembly listing can be written with the system editor, and assembled with Xmacro-86. Use the X switch of link-80 to generate a hex file on disk. Then the system debugger can be used to load the object program. Alternately, the program is short enough that the debugger DDT or SID can be used to write the code directly from the assembly listing.

The program begins with the 8080 instruction:

```
IN   FD
```

This causes the CPU to take over and begin executing instructions at the address of '0fff0' hex. A branch is placed at this point so that the execution will continue at 'start8'.

The 8086 program begins by loading the AH register with an Ascii asterisk. The repetition count of 10 is

Listing 2. Macros to convert 8080 mnemonics to 8086 code.

```
        TITLE   Convert 8080 code to 8086 with macros
        ;
ANI     MACRO   BYTE    ;AND immediate
        ANDBI   AL,BYTE
        ENDM
        ;
NOP     MACRO   ;no operation
        XCHG    AX,AX
        ENDM
        ;
CZ      MACRO   ADDR    ;call zero
        LOCAL   AROUND
        JNZ     AROUND
        CALL    ADDR
AROUND:
        ENDM
        ;
IN      MACRO   PORT    ;byte input
        INB     PORT
        ENDM
        ;
JC      MACRO   ADDR    ;Jump carry
        JB      ADDR
        ENDM
        ;
ORI     MACRO   BYTE    ;OR immediate
        ORBI    AL,BYTE
        ENDM
        ;
RAL     MACRO   ;rotate A left
        RCLB    AL,1
        ENDM
        ;
RLC     MACRO   ;rotate left circular
        ROLB    AL,1
        ENDM
        ;
RNZ     MACRO   ;return not zero
        LOCAL   AROUND
        JZ      AROUND
        RET
AROUND:
        ENDM
        ;
SHLD    MACRO   ADDR    ;store HL direct
        MOV     ADDR,BX
        ENDM
        ;
```

loaded into the CX register. The 'loop' command then causes ten asterisks to be sent to the printer. A final 'in fd' instruction returns control to the CPU.

Version 3.37 of Xmacro-86 that was available for review did not incorporate the 8080 instruction set. Consequently, the 8080 code was generated with BD pseudo op instead.

The source code for short 8080 assembly language programs can be converted to 8086 code with the system editor. For example, the global substitute command can be used to change every occurrance of 'lxi d,' to 'mov dx,'. But this conversion could be rather tedious for larger programs. One solution is to leave the 8080 mnemonics intact and use the macro facilities of Xmacro-80. Listing 2 shows several macros which will generate 8086 code when corresponding 8080 mnemonic is encountered. (More information on the use of macros can be found in my book *The 8080/Z-80 assembly language,* John Wiley, NY.)

CPU lacks call/return info

The conversion of the 8080 conditional call and return instructions is an interesting example. The 8086 CPU does not contain instructions for these operations. Consequently, a straight call or return must be used instead. This must then be preceded by a branch around with the opposite sense. For example,

```
8080 code          8086/8088 code
CZ  ADDR           JNZ     ..0001
                   CALL    ADDR
                ..0001:  . . .
```

Macros, however cannot be used to convert all 8080 mnemonics into 8086 instructions. In some cases, an 8080 mnemonic has the same spelling as the corresponding 8086 instruction. A macro called 'push' cannot be used to convert 'push D' into 'push DX'. Another problem is that the 8086 conditional jumps are limited to an 8-bit signed displacement. By contrast, the 8080 conditional jumps can go anywhere in a 64K range. Thus a long 8080 jump on zero must be coded as:

```
        JNZ     AROUND
        JMP     ADDR
AROUND: . . .
```

Listing 3. A Basic benchmark program.

```
10 DEFINT I-N
20 N = 1000
30 FOR I = 1 TO 1000
40  A = N / 1000
50  B = A * A / 50
60 NEXT I
70 PRINT CHR$(7) ' ring bell
80 END
```

At the time this review was written, only a standalone version of Microsoft Basic was available for the 8086. This is essentially the same as Microsoft's version 5 Basic interpreter for the 8080 (IA Apr 80). But the 8086 CPU can perform multiplication and division as well as addition and subtraction, whereas the 8080 can only add and subtract. Consequently, the user should see a marked increase in speed when converting to the 8086.

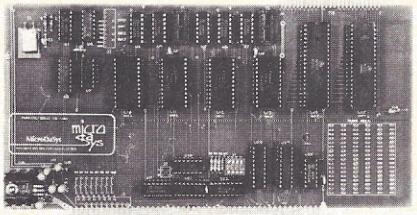
Basic was loaded into memory from disk using the 8085 CPU and CP/M. The 8088 CPU was turned on and Basic was started up. Timing tests were made with several different routines such as the one shown in listing 3. For comparison, the same programs were run with Microsoft's version 5 Basic using the 8085 and CP/M. It was found that the execution times on the 8088 were about half the corresponding times on the 8085.

It is expected that by the time this review appears, Microsoft will have available a regular CP/M-compatible Basic. This program can be loaded from CP/M and executed. Basic will switch to the 8088 for most internal operations. But all output such as console, list, and disk operations will be performed through BDOS calls to CP/M using the 8085 CPU.

The Intel 8088 and 8086 CPUs are in their infancy. We will see a surge in interest in the near future. Digital Research, (P.O. Box 579, Pacific Grove, CA 93950) has developed a CP/M-type operating system called CP/M-86. Digital Marketing has an 8086 version of Pascal (IA Sep 80). It also has a cross assembler written in Pascal. Microsoft is planning to supply 8086 versions of Fortran, Cobol, and compiling Basic. □

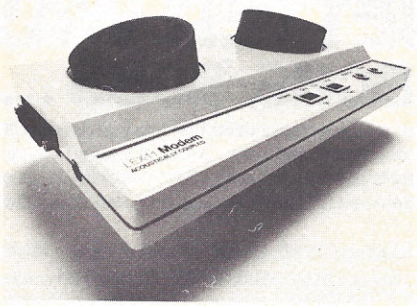
NEW PRODUCTS

Parallel/serial I/O card, model 4P4S, combines four parallel bi-directional data ports (32 I/O bits) with full handshaking and interrupt control (another 8 I/O bits). There are also four serial RS-232 input and output ports that operate under full handshaking and interrupt control. One portion of the board is pre-drilled and plated through for



use as a proto-typing area for custom applications. The board is mapped as 16 consecutive I/O ports, and will work in any Z-80, 8080, 6800, 6802, 6809, 6502, or 8085 S-100 bus system. It adheres to the IEEE standard for S-100 products. Price is $199 in kit form and $299 assembled and tested. Microdasys, P.O. Box 36215, Los Angeles, CA 90036, (213) 731-0876.
CIRCLE INQUIRY NO. 121

Low profile design modem, Lex-11, is 300 baud acoustically coupled and has originate or answer capability, full and half duplex modes, and a self-test feature, all switch selectable. LED indicators display power and ready status. The modem communicates with Bell System 103A models. The RS-232 interface makes the modem compatible with most terminals. The battery option can be used with battery powered

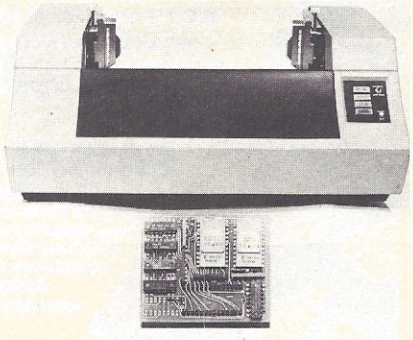


handheld terminals to allow data interchange anywhere a telephone exists. The dry cell battery pack allows modem operation for 2½-hours. The Lex-11 is housed in an injection molded plastic case measuring 10 × 5.5 × 2.4-inches and weighing 24 oz. Price: $175. Lexicon Corp. of Miami, 8355 Executive Center Dr., Miami, FL 33166, (305) 592-4404.
CIRCLE INQUIRY NO. 122

Terminal series, Executive 80, is customized to fit needs of a broad range of systems applications. The Model 20 and Model 30 are designed for applications such as data entry, form fill, data inquiry and software development. The Model 20 is a buffered video display terminal with an extensive set of video highlight and formatting features. The Model 30 is an editing terminal with expanded function key capability, additional transmission modes, paging and data validation. Standard features include: video highlighting, line drawing, status line, programmable function keys and a horizontal split screen display with non-glare monitor. The display can also be tilted, while the detached keyboard can be moved with ease. Price for Model 20 is $1,295 and for Model 30 is $1,695. Hazeltine Corp., Greenlawn, NY 11740, (516) 261-7000.
CIRCLE INQUIRY NO. 123

Intelligent terminal, Master, aimed at the OEM, small business and distributed data processing markets is the smallest (14W × 12H × 18D), lightest (approximately 20 lbs.), lowest power (about 50 watts) intelligent terminal available. Two microprocessors are utilized—a Z8 to control the video display and a 6800 to provide the intelligence. Applications requiring more processing power can be handled by upgrading to the 6809 or Z8000 microprocessor. 48K of RAM is available, and system routines are contained in 4K of ROM. The video display includes a 12" CRT, 7 × 9 dot matrix in a 9 × 13 field displaying all 128 Ascii codes, 24 lines of 39 or 80 characters with a 25th line status display, inverse or normal background, and any combination of inverse, half-intensity, blink, doublewide, underscore, and non-display attributes. Numeric pad, cursor, status configuration, and editing function keys are standard. Price: $1,995. Micro Application Systems, 5575 N. County Rd. 18, Minneapolis, MN 55442, (612) 559-0320.
CIRCLE INQUIRY NO. 124

Piggyback board, the PBB-100, adds lower case Ascii print capability and alternate character set selection under software control to most Centronics printers. The conversion board is a 2.6 by 3-inch double-sided printed circuit assembly with plated through holes that is designed to replace the ROM



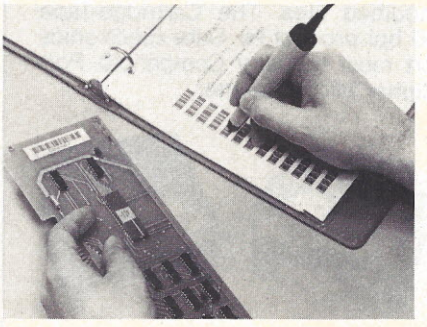
character generator integrated circuit in the printer electronics. Providing the printer with the capability to print the full 96 character Ascii set, the board can also be equipped with an optional second character set. Character sets may be selected under software control on a line by line basis or on a character by character basis. User defined character sets are made possible through the use of 2708 Eproms for character generators. Price: $95. Digital Systems Engineering, 12503 Kings Lake Dr., Reston, VA 22091, (703) 860-8990.
CIRCLE INQUIRY NO. 125

Dot matrix printer, the MS-204, is compatible with the TRS-80, Apple, Pet or any other Centronics-type system. This 132-column, bi-directional, 9 × 7 printer utilizes a print mechanism of simple design and high reliability. It has a print head life of 100 million characters. Featured are print speed of 125 CPS and a throughput print speed of 63 LPM. The adjustable sprocket feed mechanism allows use of forms from 2½-inches to 9½-inches wide, with loading from either the bottom or rear. A full 96 Ascii set permits printing upper and lower case characters which can be expanded for double-width fonts in bold face. The VFU provides pre-programmed/programmable tab positions, top of form and bottom of form. Price: $795. Matchless Systems, 18444 Broadway, Gardena, CA 90248, (213) 327-1010.
CIRCLE INQUIRY NO. 126

Super-Mod kit overcomes the 24 character/12 line video display and the 300 baud cassette limitations of the CIP and Superboard II. The kit provides a 48 character/26 line video display and software selection of 300 or 1200 baud for cassette and RS-232 operation. It also provides an RS-232 port; start/stop control of the cassette; and doubling of system clock speed (from 1 MHz to 2 MHz). The OSI monitor Prom is replaced by an expanded monitor Prom, while allowing the computer to be booted up. The kit contains all parts and documentation to perform the modification including: multiple voltage regulated power supply; a PC card containing the power supply and additional circuits; a programmed monitor Prom compatible with all existing OSI functions improved by the added capability to format the 48 character/26 line video display with screen clear function callable under Basic or Assembly language; two 2114L RAMS; a crystal to increase system speed; four ICs and sockets for baud rate increase; transistors, resistors and DB25 connector for the RS-232 port. Price: $95, add $3 for postage and handling. A.H. Systems Inc., 9710 Cozycroft Ave., Chatsworth, CA 91311, (213) 998-0223.
CIRCLE INQUIRY NO. 127

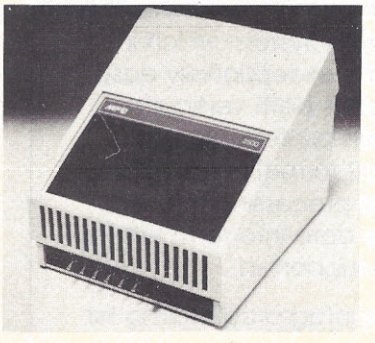
Compact size printer, the Base 2, features dot resolution graphics; forms tractor and friction feed; 2K input buffer; user programmable character set; 64, 72, 80, 96, 120 & 132 columns/line—hardware and software selectable; programmable top of form—auto skip-over-perf. All interfaces are standard: 20ma, RS232, IEEE488, Centronics parallel and interfaces to TRS-80, Apple, Atari, PET, and most other computers. Price: $699. Online Equipment Marketing, 3148 E. La Palma, Suite E, Anaheim, CA 92806, (714) 630-3623.
CIRCLE INQUIRY NO. 128

Bar code reader provides low-cost way of labeling items in a form that can be read by a scanner and entered directly to a computer system, thus eliminating manual data input. Bar code documents are used in much the same way as punch cards for error-free identification. With bar codes, there is no fixed



format media required; label can be fixed directly to the item to be tracked, thus eliminating the risk of the identifying document being separated for the item. The bar code reader uses a wand and reading head that can be set under computer control to accept one of a range of other bar codes, including U.P.C., EAN, Code 39 and 2-out-of-5. Hewlett-Packard Co., 1507 Page Mill Rd., Palo Alto, CA 94304, (415) 857-1501.
CIRCLE INQUIRY NO. 129

Cassette data terminals designed to serve as data storage and transfer subsystems for data loggers and EDP systems can hook locally to CRTs or terminal devices, or on-line into a computer system via modem or direct link. They will load programs or prerecorded diagnostics directly into CPUs. Since these terminals have interchangeable tapes, the cassettes can be read at any location equipped with an MFE



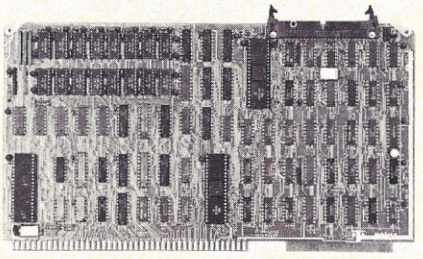
data terminal. All cassettes are Ansi/Ecma compatible. Features include formatted capacities up to 720K bytes; two input/output ports for either RS-232C interface or a 20-milliamp loop; 15,000-hour MTBF transport ratings, and TI tape compatibility. All units also feature read-after-write error checking via CRC. Prices range from $1,190 to $2,245. MFE Corp., Keewaydin Dr., Salem, NH 03079, (603) 893-1921.
CIRCLE INQUIRY NO. 130

Multibus-compatible memory module can accommodate industry-standard ROMs, Eproms and static RAMs in any combination. Multimemory Board contains sockets and memory interface logic for up to 16 24-pin memory devices. It can contain a maximum of 64K bytes of Eproms or 32K bytes of

static RAMs. The number of PC boards required in small memory systems is reduced as the memory type is configured by a header for each socket. Therefore, the board can operate with only one socket filled. Memory addresses are independently assigned for each socket with wire wrap jumpers. Any multiple of 1K bytes can be addressed within a 64K address space. Memory access time is wire-wrap selectable. Price: $175. Artec Electronics, 605 Old Country Rd., San Carlos, CA 94070, (415) 592-2740.

CIRCLE INQUIRY NO. 131

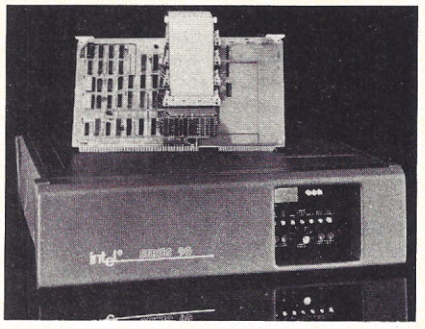
Floppy disk controller/RAM card is designed around Western Digital's floppy disk formatter/controller. It contains 32 kilobytes of dual-ported RAM, and multimode direct memory access controller for high-speed data transfers between disk and memory. The FFD-1 controls up to four single or double-sided 8-inch drives and is compatible with many units including the



SA-800 and SA-850 series. The on-board RAM can be positioned anywhere within the 1 megabyte system address space and may be enabled or disabled in 4 kilobyte increments through programmed I/O commands. Matrox Electronics Systems Ltd., 5800 Andover Ave., Montreal, Que. H4T IH4 Canada, (514) 735-1182.

CIRCLE INQUIRY NO. 132

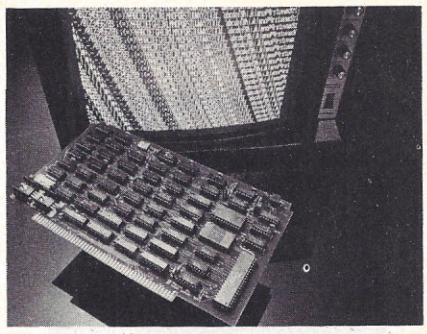
Add-on memory system, Isbc 090, features error checking and correcting (ECC) and is field-expandable to a full megabyte of storage addressable by the Isbc 86/12A single-board computer. The storage system plugs into a single card slot in the multibus backplane and is available in capacities of 128K, 256K, 512K, 768K and 1,024K bytes.



ECC circuits detect and correct random single-bit errors and detect double-bit errors. A data logger records and displays defective locations in memory by card, row, byte and bit. Price for a typical 512K-byte configuration is $16,690. Intel Corp., 3065 Bowers Ave., Santa Clara, CA 95051, (408) 987-5090.

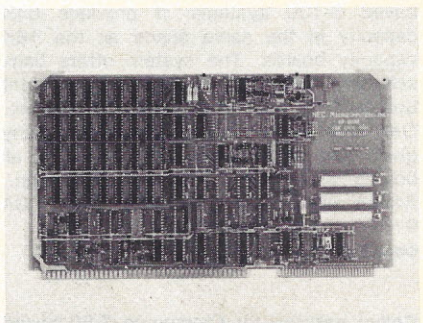
CIRCLE INQUIRY NO. 133

Video controller board with 2K bytes of on-board screen memory reduces central processor overhead. The V-100, fully compatible with the IEEE S-100 bus standard, is I/O mapped so that screen memory does not take up any space in the user's system. Interface to the video monitor is handled by



writing control information to the controller's on-board logic. It displays 24 lines by 80 characters of data in 7 by 9 dot matrix characters. Fonts are available for standard Ascii, or German, French or Japanese characters. Price: $450. Piiceon Inc., 2350 Bering Dr., San Jose, CA 95112, (408) 946-8030.
CIRCLE INQUIRY NO. 134

Nonvolatile RAM board, containing 16K bytes of read/write memory, is a memory expansion module for maintaining data during power outages or shortages. Multibus compatible, the BP-0200 features: 16K bytes of read/write memory utilizing NEC's μPD444 CMOS RAM for both 8-bit bytes and 16-bit data words; on-board batteries and battery



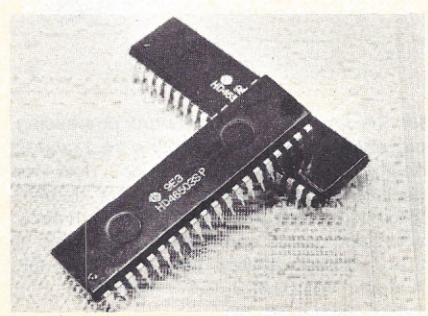
charger with short circuit and overcharge protection; memory deselect in 2K byte blocks and memory inhibit that allows paging of two or more boards to the same address block. The RAM board can be used with data logging, small business, process control and medical instrumentation systems. NEC Microcomputers, Inc., 173 Worcester St., Wellesley, MA 02181, (617) 237-1910.
CIRCLE INQUIRY NO. 135

Keyboard panel, Panelkey model PK058-001, combines the graphic panel look with tactile feel key switches. The entire keyboard panel thickness is only 1/8-inch. Keys are on 3/4-inch centers and have the conventional typewriter row offset to allow medium speed touch typing. The key legends are placed on the backside of an optically clear, polycarbonate graphic overlay. This makes the keyboard panel spill-proof and contamination proof and allows for easy cleaning. The graphic panel can be easily customized to include special legends, logo

types and symbols. The tactile feel of each keyswitch is provided by a reliable, stainless steel, dome switch. The unit interfaces to any TTL, CMOS or microprocessor circuit. The outputs are arranged in an eight by eight switch matrix format to allow easy scanning by the processor. The keyboard panel measures 13 inches × 5 inches × 1/8 inch. It can be mounted into a rectangular panel cutout via six mounting slots. Key force is 9 ounces with a snap-over tactile feedback. This allows one to rest fingers on the keyboard panel without creating inadvertent data inputs. Applications include: process control; portable computer terminals, machine tool control; factory data collection; desk top terminals, educational terminals, micro computer development systems, home computers. Price is less than $30 each in 1000 piece lots. Advanced Input Devices, Box 1818, Coeur d'Alene, ID 83814, (208) 773-3586, TWX (510) 776-0584.
CIRCLE INQUIRY NO. 136

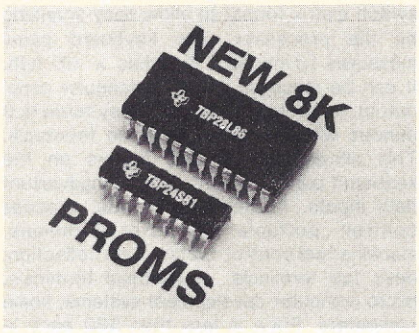
Bidirectional paper tractor, which provides forward and reverse paper motion for applications such as graphics, is an accessory for daisy wheel printers. The unit accommodates paper forms from 2- to 15-inches wide and to .025-inch thick. Paper can be positioned and tensioned accurately both vertically and horizontally. The paper tractor, controlled and driven automatically by the printer, is easy to install. Price: $250. Dataproducts Corp., 6200 Canoga Ave., Woodland Hills, CA 91365, (213) 887-8451.
CIRCLE INQUIRY NO. 137

Compatible floppy disk controller, the HD46503/MC6843, is designed to interface between a microprocessor system and a floppy disk transport. The controller's flexible hardware design enables it to be used in any microprocessor environment, and is adaptable to a wide variety of disk drive. The system uses ten macro-commands to control head movements and read/write func-



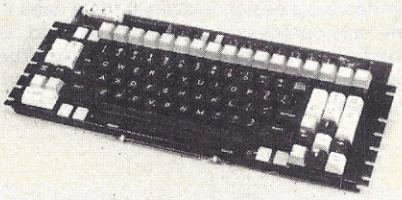
tions. Featured are programmable seek and settling times, read/write operation of consecutive sectors by a single command and both program-controlled and DMA data transfer modes. One of a series of controller chips that is priced at $11.85/100 pieces. Hitachi America, Ltd., 707 W. Algonquin Rd., Arlington Heights, IL 60005, (312) 593-7660.
CIRCLE INQUIRY NO. 138

8K Proms—faster and a lower power—feature pin-capability with existing Proms of same organizations and are characterized for operation over the 0° to 70°C temperature range. The TBP24S81 organized 2K by 4 offers a maximum access time of 70 nanoseconds, and the TBP28L86, organized 1K by 8 dissipates 350 milliwatts. The Proms use titanium-tungsten fuse links which allow fast, reliable low-voltage programming. Both



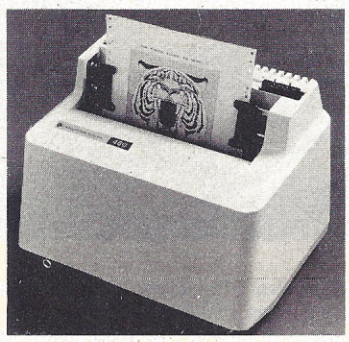
feature PNP inputs for reduced loading on system buffers/drivers. The devices are supplied with a high logic-level output condition stored at each bit location and implemented with three-state outputs. The TBP24S81 is priced at $25.50 and the TBP28L86 at $24 in 100-piece quantities. Texas Instruments Inc., P.O. Box 225012, M/S 308, Attn: TBP24S81/TBP28L86, Dallas, TX 75265.
CIRCLE INQUIRY NO. 139

Capacitance keyboard with an on-board microprocessor features two 512 × 4 Proms for encoding and the same printed circuit board that accommodates both the Prom and masked ROM versions. The MPNK-100 has five modes, single +5 VDC supply and solid state circuitry. Applications



for the keyboard include word processing, prototyping, data entry, and low cost custom designability. Features include: rigid top plate, all off the shelf components, no electrical components beneath the switch array, automatic repeat and custom key coding by the customer. Amkey, Inc., 7 Andover St., Andover, MA 01810, (617) 475-4268.
CIRCLE INQUIRY NO. 140

Desktop matrix printer, model 460, addition to the IDS Paper Tiger family, produces correspondence printing at the speed of 160 characters per second. It provides high-resolution graphics capability and programmable print control functions including proportional character spacing and automatic text justification. The printer's 9-wire ballistic print head has staggered needle rows to create vertically overlapping dots.



Advanced printing control functions include proportional spacing, enhanced text printing and standard print densities of 10- 12- or 16.7-characters-per-inch. Other features include automatic text justification, programmable horizontal and vertical tabbing and reverse paper feed. Price: $1,295. Integral Data Systems, Inc., 14 Tech Circle, Natick, MA 01760, (617) 237-7610.
CIRCLE INQUIRY NO. 141

Dynamic memory board, designed to expand the capability of OEM equipment, is a general purpose board used with most Z-80 based S-100 systems. It provides 64K capacity in the same space as the 16K capacity boards. The system offers bank selecting capability, allowing up to eight boards to be used in a system at one time. Only one board actually responds to any given time, but memory is retained in all boards all the time. Vector Graphic, Inc., 31364 Via Colinas, Westlake Village, CA 91361, (213) 991-2302.
CIRCLE INQUIRY NO. 142

Cobol version for Cromemco Z-80 based microcomputer systems is based on American National Standard X3.23-1974, contains several important new features, including interactive 'accept' and 'display', file naming at runtime, 'linage' for printer files, and more efficient compiler memory usage. The enhanced 'accept' and 'display' allows programmers to write programs which display items anywhere on the terminal screen and likewise accept data from any location. The 'linage' clause allows the programmer to declare the page length and size of the top and bottom margins. Cobol will then maintain a line count and can perform a programmer-specified action, such as page subtotal, when the page body becomes filled. A more efficient compiler memory usage algorithm permits the compilation of a program containing more than 3000 lines in a Cromemco system with 64K memory. The version is available on 5-inch and 8-inch IBM-format, floppy diskettes for $95. Cromemco, Inc., 280 Bernardo Ave., Mountain View, CA 94043, (415) 964-7400.
CIRCLE INQUIRY NO. 143

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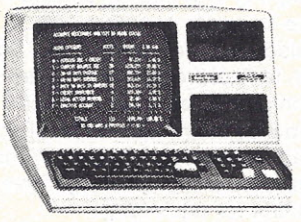

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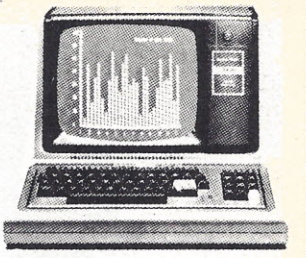

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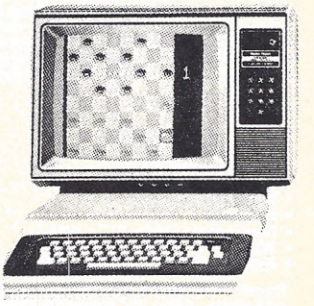

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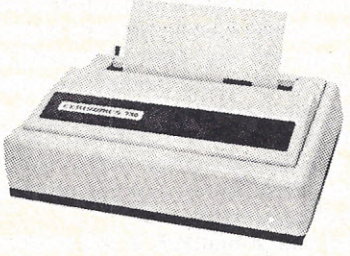

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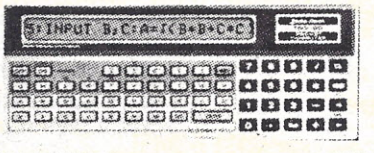

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BOOK REVIEWS

Programming the Z8000
by Richard Mateosian
Sybex, Berkeley, CA

Reviewed by Dennis Doonan

This instructional text and reference manual for the 16-bit Z8000 microprocessor provides a comprehensive overview of Z8000 architecture and a sound introduction to machine-language programming, including advanced techniques.

The book requires little background and is easy to follow. It should be useful to those designing with microprocessors or students interested in machine-language programming.

The book begins with a discussion of algorithms, flowcharts, number systems, and text representation. The examples start with a simple, non-computer case, and build to full program development, showing how machine level software can be accomplished with simplicity and clarity. A data encryption program is developed from the initial algorithm to final coding, with full explanations for each step.

Other programs include a 7-segment output display, a complete terminal service routine, an I/O initiator, a translator (associate search), and a time-sharing system of shared programs and separate user stacks. An overview of text editors, assemblers, and debugging packages is also provided.

Z8000 architecture is introduced with a discussion of computer words, the various registers, stacks, memory segmentation, memory mapping, traps and interrupts, addressing and I/O techniques. The Z8000 is shown in relation to support members such as the memory management unit, serial and parallel ports, the counter/timer, the DMA controller, the CRT controller, and the floppy disc controller. The single chip CPU (Z8002) and the full power CPU (Z8001) are compared and shown in interaction with other components.

One of the book's most useful features is the reference section, providing facts needed to write effective software. Included is a systematic presentation of all Z8000 instructions in a standard format, assembler mnemonic, a model assembly language statement, the available options, flags affected, and the instruction timing.

312 pages $15.95

Checklist/Guide to Selecting a Small Computer
by Wilma E. Bennett
Pilot Books, New York, NY

Reviewed by Les Spindle

This compact booklet consists of 332 checklist questions, a brief glossary, and a sparse introduction. The stated purpose is to provide the consumer with a list of the most important criteria to keep in mind when shopping for a computer. The idea of stripping down cumbersome material to bare essentials is promising, although some readers will miss the clarity of more detailed information.

The questions are subdivided into: display features, keyboard, printer, controller, software, word processing, service, training, costs, and miscellaneous. They run from "Can the display be tilted to minimize glare?" to "What is the cost of training people to use the system?" A few questions are so obvious that they are likely to insult the reader's intelligence. In our economy-conscious world, is it really necessary to remind the buyer to ask the purchase price?

Though most of the questions represent more intelligent criteria, they also presume a great deal of computer literacy on the part of the reader. A novice is not likely to understand many of them, but an experienced computer buff should find the checklist a handy shopping guide.

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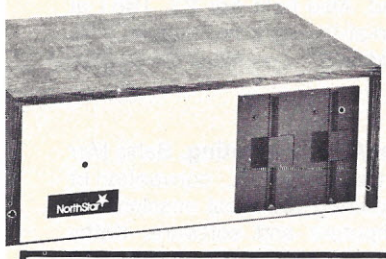

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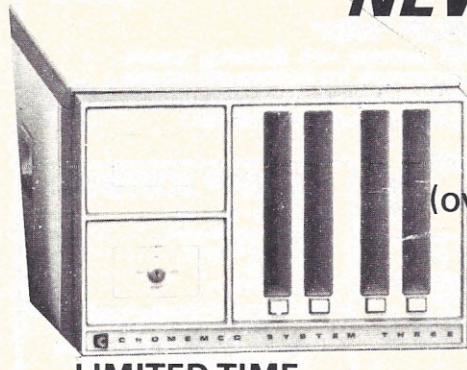

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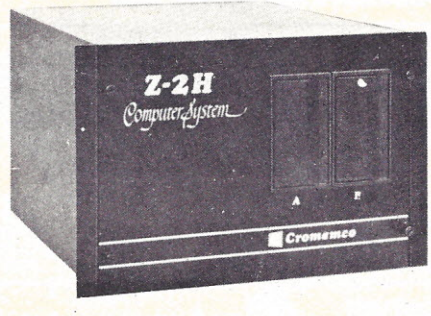

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Dec 1-3 Computer Crime Info Conference, Crystal City Marriott Hotel, Arlington, VA, in-depth discussions of solutions to computer security issues for government and business executives. Information Exchange, 1730 N. Lynn St., Suite 400, Arlington, VA 22209, (703) 521-6209.

Dec 4 California Computer Shows, Hyatt-Palo Alto, Palo Alto, CA, OEM and end-user computer and peripheral products exibited and demonstrated. Also held Apr 23, 1981 at Hyatt and Mar 12, 1981 at Inn-at-the-Park in Anaheim, CA. Norm De Nardi Enterprises, 95 Main St., Los Altos, CA 94022, (415) 941-8440.

Dec 7-11 Muse N. American Annual Meeting, Bahia Mar Hotel and Yachting Center, Ft. Lauderdale, FL, convention of Modcomp Users Exchange featuring technical session and workshops on Modcomp computers and software. Kathy Black, Modcomp Users Exchange, 4620 W. Commercial Blvd./Suite 6C, Tamarac, FL 33319, (305) 485-8270.

Dec 9-11 Western Design Engineering Show and Conference. Convention Center, Anaheim, CA, emphasis on fiber optics, also composite materials, advances in the methods for machining metal parts, computer-aided design, computer-aided manufacturing, high pressure hydraulics. Clapp and Poliak, 245 Park Ave., New York, NY 10017.

Jan 13-15 Communication Networks Conference and Exposition, Albert Thomas Convention Ctr., Houston, TX, brings together communications professionals, policy makers, carrier, service and hardware vendors interested in combining voice, data and message systems applications. Terri Hamilton, 60 Austin St., Newton, MA 02160, (800)1225-4260.

Jan 16-17 Microcomputer Educational Conference, Arizona State U, Tempe, AZ, forum to introduce educators to the many applications of microcomputers in the classroom, including elementary and secondary schools, fine arts, career and vocational studies and special education. Dr. Gary G. Bitter, Arizona State U., Payne 203, Tempe, AZ 85281.

Jan 27-29 Advanced Semiconductor Equipment Exposition, San Jose Convention Center, San Jose, CA, new products and emerging technology in semiconductor equipment explored in seminars and exhibits. Cartlidge & Assoc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94806, (408) 245-6870.

Feb 4-5 Computer and Office Automation Show and Conference, Hyatt Regency Hotel, Vancouver, data processing equipment, small business computers, peripheral products, medium and high speed copiers, word processing systems, data communication gear and services and a full range of conventional office products and services. Whitsed Publishing Ltd., Manulife Centre, 55 Bloor St. W., Suite 1201, Toronto, Ont., Can M4W 3K2, (416) 967-6200.

Feb 24-26 Nepcon West '81, Convention Center, Anaheim, CA, PCB/PWB microelectric materials, hardware, tools, supplies, and test instruments for engineering packaging/production specialists. ISCM, 222 W. Adams St., Chicago, IL 60606, (312) 263-4866.

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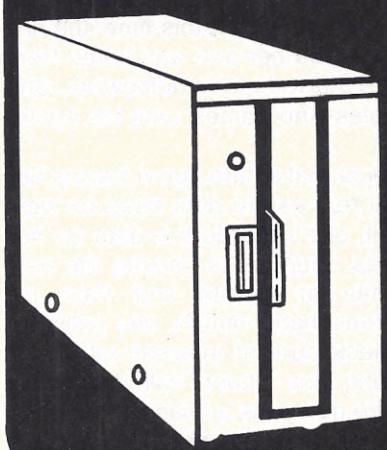

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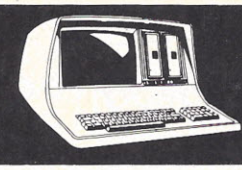

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"Someone must have put in a card that was folded or mutilated or spindled!"

Personal Computers

Continued from page 68

the following day. She then authorizes payment of the electric and water bills by electronic funds transfer, and moves $1,000 from her savings account to the checking account.

Stay tuned for latest reports

She broadcasts a message to her church circle announcing that the next meeting will be a conference session using their home computers since several of the members have had difficulty getting babysitters. (She also posts a general request to the neighborhood asking for a babysitter for herself for Saturday night.) Again from her terminal, she checks the afternoon newspaper for a report on the local weather and the final stock reports. All this saves several gallons of gas and another barrel of imported oil. At this time she has to get off the computer since her son was home from school and wished to get started on his homework. She reminded him of the rules—no games until his homework was finished.

And still another: A local real estate agent begins her day by polling the local real estate data base for new listings. Finding several, she records the data on her own local computer files, then cross checks the new listings against her file of clients and their requirements. Finding a reasonable match, she polls the banking network to check current interest rates and loan points (thus making one phone call instead of many). With this data she now runs a financial model to show her client what the monthly payment would be for different loan options.

All this can be done in one hour, a task now requiring half a day of phoning, calculating, and writing. Moreover, the job was done more thoroughly, and saved a trip to the office.

Peter Bonfield, Personal Computer Div manager, Texas Instruments, echoes Whitney's assessment of the 80s, and adds a few predictions of his own:

Economic pressures will coincide with significant shifts in American lifestyles. A more highly educated population will require greater access to life-long educational opportunities and a fast, efficient method of information distribution.

Youths brought up on calculators and computers will become adults who are more electronically aware. At the same time, society will comprise many more working women and more single-person households. Both will welcome all the electronic assistance they can get to make homelife more convenient.

At the present time, we do not see the home computer as being the single piece of electronic equipment that encompasses all home electronic functions. Rather, we see the development of home electronics as the gradual acquisition of various stand-alone capabilities, moving on essentially parallel paths, which later become fully integrated with the evolving home computer into a complete home electronics system.

The two most significant additions to home-electronics capabilities during the early 80s will be the home computer and the video disk player. The video disk provides a storage capacity of more than 50,000 frames per disk side, plus random access and freeze-frame capability. When combined with low cost and compact size, these features will lead to a high level of acceptance as a home information-retrieval device.

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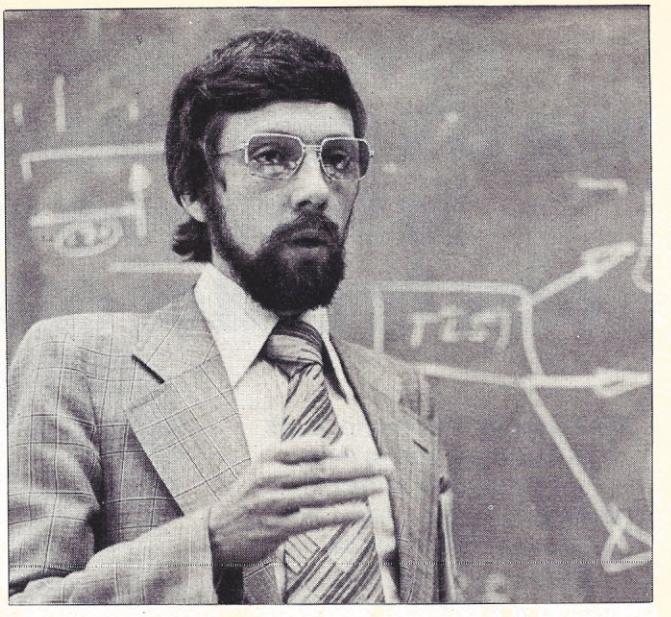

"A telephone call from the office to your home computer will turn on your air conditioning so the house is comfortable when you get home, cook your dinner, wash your clothes, and check the security system to provide assurance that all is well."—*Bonfield.*

By itself, the medium of television has not lived up to its early promise as an educational tool, primarily because of its lack of interaction capability with learners.

But interaction is a principal feature of the home computer, particularly when teamed with the random-access features of the video disk. Together, they offer a powerful, synergistic capability for making home education interactive, self-paced, and learner-controlled. The learner actively participates in the educational process, instead of merely sitting passively while information from the TV screen washes over him.

A variety of public school courses can be effectively offered on an interactive basis, including remedial tutoring, extra credit and special projects for bright students, plus home access to a wide range of library information.

Adult education courses will include interactive opportunities for updating professional skills, along with various home management and home maintenance subjects, and expanded general awareness and enrichment courses.

The system called Viewdata offers tremendously expanded capability to the owners of home computers. Because of the two-way communication available with telephone lines, more than a half million screens of information can be made available at the user's fingertips, either for display on his TV screen or in hardcopy form with the help of a low-cost printer.

In addition, the user can communicate with other subscribers to the same data base via electronic mail, and he can store his own programs in remote disk memory.

These dial-up services, available today, give private individuals access to many of the same information banks once available only to commercial users. Additional consumer-oriented information services are rapidly being added.

Electronic mail will provide instantaneous delivery of written messages to the homes of relatives and friends, as well as to businesses. And remote electronic polling

will make it possible for individuals to register personal preferences about anything from products to election candidates. All these applications will be driven by increasingly acute shortages of energy for transportation.

The most talked-about capability of the home computer—that of home monitoring and control—will actually be the last to become generally available. This subsystem includes environmental control or space conditioning, appliance control, emergency and security control, diagnostics on each piece of home equipment, and remote communications for monitoring and control by the occupant who is vacationing or otherwise away from home.

Energy costs are projected to increase by at least 10% per year over the decade. These soaring increases will make programmable electronic set-back thermostats very attractive. Using a home computer, the user will be able to calculate household energy consumption, projecting the cost impact if a thermostat setting is changed up or down.

Solar energy will become a popular source of heat for producing hot water—typically 16% of home energy requirements. A microprocessor control system will be required to balance the solar system with the conventional heating system.

Lighting comprises another 8% of home energy requirements. The control system will help conserve energy by using presence sensors which automatically turn off the lights and reduce heating or cooling when a room is vacated.

The emergency control module of the system may include detectors for fire and smoke, for intrusion into the home or yard, for open windows and unlocked doors, and for hazards such as a flooding basement or a gas leak. Also increasingly sophisticated security systems will provide early warning of approaching natural disasters such as tornadoes, hurricanes or earthquakes.

One of the most appealing features of an electronically-equipped home is having equipment which signals when it is not functioning properly. Diagnostic controls are available today for air conditioning systems, and this will soon be extended to appliances. The homeowner will also be able to drive his or her automobile into the garage for the evening, plugging it into a home diagnostic system which will provide a readout on potential problems. And a home with persons who have special medical problems such as heart disease could easily include facilities for monitoring heart rate and blood pressure.

Our projection indicates that a complete home electronics center will be generally available and affordable to homeowners by the end of the decade. Once again, the timely combination of advanced technologies, innovative products, real consumer needs, and aggressive marketing will have developed a new and significant consumer market segment.

Because a home electronics center is a complex system, as compared with the relatively simple radio, calculator, learning aid, or even the home computer, this new market segment will take longer to develop. But the size of the resulting systems market will be much larger, and the total impact on the American family's lifestyle is likely to be much greater than any of us can possibly anticipate. □

Real Estate
Continued from page 74

chase price are related and simple formulas can be used to evaluate the purchase price if desired return rate is input, or conversely, to evaluate return rate if desired purchase price is input.

In lines 2210, 2940 and 3010, the operator is requested to input a value for X, the desired purchase price or return rate percent. A value equal to or greater than 100 is assumed to be the purchase price. Lines 3680-3730 evaluate the purchase price or return rate percent depending on the value of X.

Both tabular and graphical output are generated with the 'tab' function. For options 3 and 4, return rate percent is plotted across the page and purchase price down the page. Conversion of return rate percent to column number is accomplished with the defined function T(Y) in line 1040. With reasonable margins, a 60-column by 46-line graph is obtained on an 8½ by 11 inch page. However, graphs are not limited to 46 lines.

The number of tabular values and plotted values are input parameters. Logic is provided in lines 2700-2760 for plotting three graphs (which may cross) on one page and in lines 2820-2880 for printing the proper identifying labels. This provides the plots for the fourth option.

An alternative approach to generating a multiple-plot graph is to construct a 60-element string variable for each plot line in a 'for-next' loop. Sixty passes through the loop would be required to generate each line for option 3. An additional three-pass inner 'for-next' loop would be required to generate each of the 60 string variable elements for option 4.

The string variable approach to generating the plot lines was rejected because plotting time would be increased by a factor of four over that provided by the logic in lines 2700-2760. For a compiled version of Basic, this plotting-time difference would be less.

The plotting subroutines assume the return rate will be between 0-20%. Therefore, if plots are desired, the best strategy is to exercise one of the tabular options to determine the range of input values required to obtain plots within the return rate percent limits. If a value of return rate outside the limits is obtained after selection of a plot option, the operator is asked to try a different initial value for the purchase price (line1760).

Output to the printer is caused by the 'assign(2,3)' statement in lines 1960 and 3430. This connects the printer to the logical output stream transmitted to the CRT. The statement, 'assign(2,2)', in lines 1760, 2080 and 2140 disconnects the printer from the logical output stream to the CRT.

Figures 1 and 2 show the steps involved in obtaining the tabular output provided by options 1 and 2 and the graphical output of option 4. All of the information shown is displayed on the CRT. As before, the tables and graphs following the question "do you want a printed output (Y/N)?" are printed if the operator responds with a Y and carriage return. The option 3 output is similar to the graph in figure 2 except one curve only is plotted and no label is printed.

Obtaining a satisfactory income-producing property involves reviewing a number of property listings and examining various ways of improving the return rate. This program provides the investor with a computational tool for quickly performing this type of analysis. □

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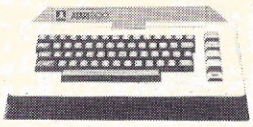

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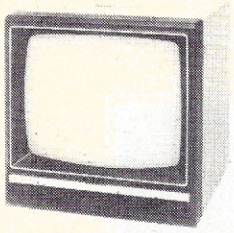

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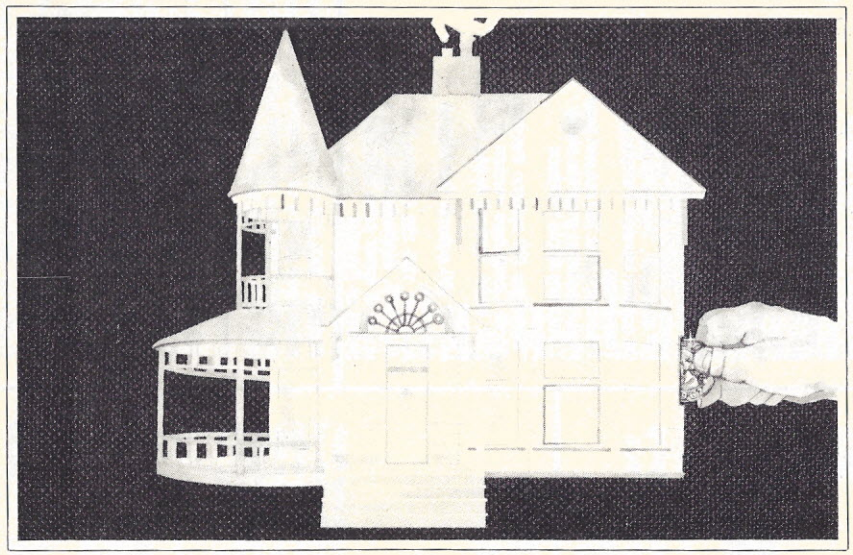

PROGRAM LISTING

```
1000 !           REAL ESTATE INCOME INVESTMENT ANALYSIS PROGRAM
1010 !
1020 SIZES (6,4,30)
1030 DIM Q$(1)
1040 DEF FNT(Y) = 15 + 3*INT(Y) + INT(3*FRAC(Y))
1050 INPUT "DO YOU WANT TO USE THE SAMPLE DATA BASE (Y/N)";Q$
1060 IF Q$ = "N" GOTO 1110
1070 GOSUB 1820: GOTO 1330
1080 !
1090 !   INITIAL INPUT
1100 !
1110 PRINT
1120 INPUT "DOWN PAYMENT (%PP)          =";D: ! %PP = % OF PURCHASE PRICE
1130 INPUT "ANNUAL GROSS INCOME ($)     =";G
1140 INPUT "VACANCY RATE (%)            =";V
1150 INPUT "MORTGAGE INTEREST RATE (%/Y)=";I: ! %/Y = % PER YEAR
1160 INPUT "MORTGAGE PAY-OFF TIME (Y)   =";N
1170 INPUT "MORTGAGE LOAN POINTS (%L)   =";P: ! %L  = % OF LOAN
1180 PRINT "ANNUAL OPERATING EXPENSES:":
1190 INPUT "TAXES                ($)    =";T : ! ******************************
1200 INPUT "INSURANCE            ($)    =";I1: ! *                            *
1210 INPUT "ADMINISTRATION       ($)    =";A : ! *         DEVELOPED          *
1220 INPUT "MAINTENANCE          ($)    =";M : ! *                            *
1230 INPUT "UTILITIES            ($)    =";U : ! *             BY             *
1240 PRINT "ESCROW COSTS: ";                 ! *                            *
1250 INPUT "TITLE INSURANCE      (%PP)  =";T1: ! *      A. B. CHATFIELD       *
1260 INPUT "PRO RATA RENT        (%PP)  =";R1: ! *                            *
1270 INPUT "PRO RATA TAXES       (%PP)  =";T2: ! *          MAY 1980          *
1280 INPUT "PRO RATA INSURANCE   (%PP)  =";I2: ! *                            *
1290 INPUT "OTHER COSTS          (%PP)  =";O1: ! ******************************
1300 !
1310 !   INPUT PARAMETERS THAT CAN BE VARIED
1320 !
1330 D$ = "DOWN PAYMENT (%PP)":          G$ = "ANNUAL GROSS INCOME ($)"
```

```
2000 RETURN
2010 !
2020 !   LIST INPUT DATA - DISCONNECT PRINTER FROM OUTPUT
2030 !
2040 PRINT TAB(2) LEFT$(D$,13); TAB(27); " =     "; FMT(D,S$); " %PP"; TAB(44);
     LEFT$(G$,20); " = "; FMT(G,A$)
2050 PRINT TAB(2) LEFT$(V$,13); TAB(27); " =     "; FMT(V,S$); " %/Y"; TAB(44);
     LEFT$(I$,19); "  =      "; FMT(I,S$); " %/Y"
2060 PRINT TAB(2) LEFT$(N$,22); TAB(27); " =     "; FMT(N,S$); " Y"; TAB(44);
     LEFT$(P$,21); "=      "; FMT(P,S$); " %L"
2070 PRINT TAB(2) LEFT$(O$,26); TAB(27); " = $"; FMT(O,J$); TAB(44);LEFT$
     (E$,13);"         =      ";FMT(E,S$);" %PP"
2080 PRINT: PRINT: ASSIGN(2,2)
2090 RETURN
2100 !
2110 !   DISCONNECT PRINTER FROM OUTPUT - RESTORE X TO ORIGINAL VALUE - ALL OP.
2120 !
2130 PRINT: PRINT
2140 IF Q$ = "Y" THEN ASSIGN(2,2)
2150 IF X2 < 1 THEN X = X2*100
2160 X = X2
2170 RETURN
2180 !
2190 !   PRINT OPTION 1 TABLE - PURCHASE PRICE VS RETURN RATE (%)
2200 !
2210 INPUT "DESIRED PURCHASE PRICE OR RETURN RATE (%)";X: PRINT
2220 X2 = X
2230 INPUT "NUMBER OF TABLE VALUES, STEP SIZE";N1,S1: PRINT
2240 IF X < 100 THEN X = X/100: S1 = S1/100
2250 GOSUB 3420: GOSUB 3510
2260 FOR J = 1 TO N1
2270 GOSUB 3680: GOSUB 3770
2280 X = X + S1
2290 NEXT J
2300 GOSUB 2130
2310 RETURN
2320 !
2330 !   PRINT OPTION 2 TABLE - PUR. PRICE, RETURN RATE (%) VS INPUT PARAMETER
2340 !
2350 GOSUB 2940: GOSUB 3100: GOSUB 3820: GOSUB 3420: GOSUB 3970
2360 FOR K = 1 TO N2
2370 GOSUB 4020: GOSUB 3680: GOSUB 4130
2380 C = C + S2
2390 NEXT K
2400 GOSUB 2130: GOSUB 4190
2410 RETURN
2420 !
2430 !   PLOT OPTION 3 GRAPH - PURCHASE PRICE VS RETURN RATE (%)
2440 !
2450 GOSUB 3010: GOSUB 3420: GOSUB 4310
2460 L = 1: L2 = (N3 - L1)/2: N4 = 3
2470 FOR J = 1 TO N3
2480 X = X + S3
2490 GOSUB 3680: P1 = FNT(R)
2500 IF P1 < 15 OR P1 > 75 GOTO 1760
2510 IF J <= L2 OR J > (L1 + L2) THEN N4 = 4
2520 IF FRAC(J/2) < 1.E-10 GOSUB 4380
2530 IF FRAC(J/2) >=1.E-10 GOSUB 4450
2540 NEXT J
2550 GOSUB 2130
2560 RETURN
2570 !
2580 !   PLOT OPTION 4 GRAPH - PUR. PRICE VS RETURN RATE (%) FOR 3 PAR. VALUES
2590 !
2600 GOSUB 3010: GOSUB 3170: GOSUB 3820: GOSUB 4020: GOSUB 3420: GOSUB 4310
2610 L = 1: L2 = (N3 - L1)/2: N4 = 3
2620 FOR K = 1 TO N3
2630 X = X + S3
2640 GOSUB 3680: R9 = R: P1 = FNT(R)
2650 IF P1 < 15 OR P1 > 75 GOTO 1760
```

```
1340 V$ = "VACANCY RATE (%)":                    I$ = "MORTGAGE INT. RATE (%/Y)"
1350 N$ = "MORTGAGE PAY-OFF TIME (Y)":           P$ = "MORTGAGE LOAN POINTS (%L)"
1360 O$ = "ANNUAL OPERATING EXPENSES ($)":E$ = "ESCROW COSTS (%PP)"
1370 L$ = "PURCHASE PRICE":                      R$ = "RETURN RATE (%)"
1380 !
1390 !   NUMERICAL OUTPUT FORMATS
1400 !
1410 M$ = "$ZZZZZZZV.99":                        U$ = "ZZZZZV.99"
1420 T$ = "ZZZZZZV.99":                          F$ = "ZZZV.99"
1430 A$ = "$ZZZZZZ":                             S$ = "ZZZ"
1440 J$ = "ZZZZZ":                               B$ = "ZZ"
1450 L1 = LEN(L$):                               Y$ = "-"
1460 !
1470 GOSUB 1890
1480 PRINT: INPUT "DO YOU WANT A LISTING OF THE INPUT DATA (Y/N)";Q$: PRINT
1490 IF Q$ = "N" GOTO 1520
1500 E = E*100: GOSUB 1950: GOSUB 2040: E = E/100
1510 !
1520 INPUT "DO YOU WANT TO CHANGE THE INPUT DATA (Y/N)";Q$: PRINT
1530 IF Q$ = "Y" THEN O = 0: E = 0: GOTO 1120
1540 D  = D/100:   V = V/100:   P = P/100:   I = I/100
1550 D9 = D:       G9 = G:      V9 = V:      I9 = I:      N9 = N:      P9 = P
1560 !
1570 INPUT "DO YOU WANT A LIST OF THE OUTPUT OPTIONS (Y/N)";Q$: PRINT
1580 IF Q$ = "N" GOTO 1680
1590 PRINT "OUTPUT OPTIONS AVAILABLE"
1600 PRINT
1610 PRINT "1  A TABLE OF PURCHASE PRICE VS RETURN RATE (%)"
1620 PRINT "2  A TABLE OF PURCHASE PRICE, RETURN RATE (%) VS ONE OF THE INPUT";
       " PARAMETERS"
1630 PRINT "3  A PLOT OF PURCHASE PRICE VS RETURN RATE (%)"
1640 PRINT "4  A PLOT OF PURCHASE PRICE VS RETURN RATE (%) FOR THREE VALUES";
       " OF ONE INPUT"
1650 PRINT "   PARAMETER"
1660 PRINT
1670 !
1680 INPUT "ENTER NUMBER TO SELECT DESIRED OUTPUT OR 0 TO END RUN";Z: PRINT
1690 IF Z = 0 GOTO 4710
1700 IF Z < 0 OR Z > 4 THEN PRINT "INPUT ERROR - SELECT OUTPUT OPTION AGAIN":
     PRINT: GOTO 1570
1710 ON Z GOSUB 2210,2350,2450,2600
1720 !
1730 INPUT "DO YOU WANT TO MAKE ANOTHER RUN (Y/N)";Q$: PRINT
1740 IF Q$ = "Y" GOTO 1570
1750 GOTO 4710
1760 PRINT "RETURN RATE OUT OF RANGE (0%-20%), TRY NEW INITIAL VALUE FOR PUR";
     "CHASE PRICE": PRINT: GOSUB 4190: ASSIGN(2,2)
1770 IF Z = 3 GOTO 2450
1780 IF Z = 4 GOTO 2600
1790 !
1800 !   READ SAMPLE SET OF INVESTMENT DATA
1810 !
1820 RESTORE 1830
1830 DATA 29,26000,5,10,20,5,3000,100,1800,1500,3400,.80,.85,.20,.05,.10
1840 READ D,G,V,I,N,P,T,I1,A,M,U,T1,R1,T2,I2,O1
1850 RETURN
1860 !
1870 !   DETERMINE TOTAL OPERATING EXPENSES AND TOTAL ESCROW COSTS
1880 !
1890 M1 = R1 + T2 + I2 + O1:       E  = T1 + M1:  E  = E/100
1900 O  = T  + I1 + A  + M + U:    O9 = O:        E9 = E
1910 RETURN
1920 !
1930 !   CONNECT PRINTER TO OUTPUT & PRINT INPUT DATA TABLE HEADING
1940 !
1950 INPUT "DO YOU WANT A PRINTOUT OF THE INPUT DATA (Y/N)";Q$
1960 IF Q$ = "Y" THEN ASSIGN(2,3)
1970 PRINT: PRINT
1980 PRINT TAB(17) "INPUT DATA FOR REAL ESTATE INCOME ANALYSIS";
1990 PRINT: PRINT
2660 C = C + K9*S2: GOSUB 4020: GOSUB 3680: P2 = FNT(R): C3 = C
2670 IF P2 < 15 OR P2 > 75 GOTO 1760
2680 C = C + K9*S2: GOSUB 4020: GOSUB 3680: P3 = FNT(R): C4 = C: R = R9
2690 IF P3 < 15 OR P3 > 75 GOTO 1760
2700 IF P1 <= P2 AND P2 <= P3 THEN IF P1 <= P3 THEN GOTO 2770
2710 J1 = P1: J2 = P2: J3 = P3
2720 IF P1< P2 AND P3<=P2 THEN IF P1<=P3 THEN P1=J1: P2=J3: P3=J2: GOTO 2770
2730 IF P1<=P2 AND P3< P2 THEN IF P3<=P1 THEN P1=J3: P2=J1: P3=J2: GOTO 2770
2740 IF P2<=P1 AND P2< P3 THEN IF P1<=P3 THEN P1=J2: P2=J1: P3=J3: GOTO 2770
2750 IF P2< P1 AND P2<=P3 THEN IF P3<=P1 THEN P1=J2: P2=J3: P3=J1: GOTO 2770
2760 IF P2<=P1 AND P3<=P2 THEN IF P3< P1 THEN P1=J3: P2=J2: P3=J1
2770 IF K <= L2 OR K > (L1 + L2) THEN N4 = 4
2780 IF FRAC(K/2) < 1.E-10 GOSUB 4520
2790 IF FRAC(K/2) >=1.E-10 GOSUB 4590
2800 C = C2: GOSUB 4020
2810 NEXT K
2820 IF C2<=C3 AND C3<=C4 THEN IF C2<=C4 THEN GOTO 2890
2830 K2 = C2: K3 = C3: K4 = C4
2840 IF C2< C3 AND C4<=C3 THEN IF C2<=C4 THEN C2=K2: C3=K4: C4=K3: GOTO 2890
2850 IF C2<=C3 AND C4< C3 THEN IF C4<=C2 THEN C2=K4: C3=K2: C4=K3: GOTO 2890
2860 IF C3<=C2 AND C3< C4 THEN IF C2<=C4 THEN C2=K3: C3=K2: C4=K4: GOTO 2890
2870 IF C3< C2 AND C3<=C4 THEN IF C4<=C2 THEN C2=K3: C3=K4: C4=K2: GOTO 2890
2880 IF C3<=C2 AND C4<=C3 THEN IF C4< C2 THEN C2=K4: C3=K3: C4=K2
2890 GOSUB 4190: GOSUB 4660: GOSUB 2130
2900 RETURN
2910 !
2920 !   INPUT PURCHASE PRICE OR RETURN RATE (%) - OPTION 2
2930 !
2940 INPUT "DESIRED PURCHASE PRICE OR RETURN RATE (%)"; X: PRINT
2950 IF X < 100 AND X > 1 THEN X = X/100
2960 X2 = X
2970 RETURN
2980 !
2990 !   INPUT PURCHASE PRICE AND PLOTTING DATA - OPTIONS 3 & 4
3000 !
3010 INPUT "ENTER INITIAL VALUE OF PURCHASE PRICE, PURC. PRICE STEP SIZE";X,S3
3020 PRINT: X2 = X
3030 INPUT "ENTER NUMBER OF POINTS TO BE PLOTTED";N3: PRINT
3040 IF N3 > L1 + 1 THEN GOTO 3060
3050 PRINT "NUMBER OF POINTS MUST BE > ";L1 + 1: PRINT: GOTO 3030
3060 RETURN
3070 !
3080 !   INPUT DATA FOR PARAMETER TO BE VARIED - OPTION 2
3090 !
3100 GOSUB 3290
3110 INPUT "ENTER INITIAL VALUE OF PARAMETER TO BE VARIED";C: PRINT
3120 INPUT "ENTER NUMBER OF TABLE VALUES, STEP SIZE";N2,S2: PRINT
3130 RETURN
3140 !
3150 !   INPUT SYMBOL FOR PARAMETER TO BE VARIED - OPTION 4
3160 !
3170 GOSUB 3290
3180 IF C$ = "D" GOSUB 3560: RETURN
3190 IF C$ = "G" GOSUB 3620: RETURN
3200 IF C$ = "V" GOSUB 3560: RETURN
3210 IF C$ = "I" GOSUB 3560: RETURN
3220 IF C$ = "N" GOSUB 3620: RETURN
3230 IF C$ = "P" GOSUB 3560: RETURN
3240 IF C$ = "O" GOSUB 3560: RETURN
3250 IF C$ = "E" GOSUB 3560: RETURN
3260 !
3270 !   LIST AVAILABLE SYMBOL-PARAMETER CHOICES - OPTIONS 2 & 4
3280 !
3290 PRINT "ENTER SYMBOL OF PARAMETER TO BE VARIED ": PRINT
3300 INPUT "DO YOU WANT A LIST OF PARAMETER SYMBOLS";Q$
3310 IF Q$ = "N" GOTO 3370
3320 PRINT
3330 PRINT "  D FOR ";D$; TAB (40); "  G FOR ";G$
3340 PRINT "  V FOR ";V$; TAB (40); "  I FOR ";I$
3350 PRINT "  N FOR ";N$; TAB (40); "  P FOR ";P$
```

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3360 PRINT "  O FOR ";O$; TAB (40); "  E FOR ";E$
3370 PRINT: INPUT C$: PRINT
3380 RETURN
3390 !
3400 !   CONNECT PRINTER TO OUTPUT AND PRINT ANALYSIS HEADING - ALL OPTIONS
3410 !
3420 INPUT "DO YOU WANT A PRINTED OUTPUT (Y/N)";Q$
3430 IF Q$ = "Y" THEN ASSIGN(2,3)
3440 PRINT: PRINT
3450 PRINT TAB(20) "RESULTS OF REAL ESTATE INCOME INVESTMENT ANALYSIS";
3460 PRINT: PRINT
3470 RETURN
3480 !
3490 !   PRINT TABLE HEADING - OPTION 1
3500 !
3510 PRINT TAB(23) L$; TAB(52); R$: PRINT
3520 RETURN
3530 !
3540 !   INPUT FINAL VALUE AND STEP SIZE OF PARAMETER TO BE VARIED - OPTION 4
3550 !
3560 INPUT "ENTER FINAL VALUE OF PARAMETER TO BE VARIED, STEP SIZE";C,S2: PRINT
3570 C2 = C: K9 = -1
3580 RETURN
3590 !
3600 !   INPUT INITIAL VALUE AND STEP SIZE OF PARAMETER TO BE VARIED - OPTION 4
3610 !
3620 INPUT "ENTER INITIAL VALUE OF PAR. TO BE VARIED, STEP SIZE";C,S2: PRINT
3630 C2 = C: K9 =  1
3640 RETURN
3650 !
3660 !   EVALUATE DESIRED PURCHASE PRICE OR RETURN RATE (%) - ALL OPTIONS
3670 !
3680 S  = I/(1 - (1 + I)^-N)
3690 A1 = G*(1 - V) - O:      B1 = S*(1 - D):      C1 = D + P*(1 - D) + E
3700 IF X < 1 THEN R = X*100: GOTO 3730
3710 P0 = X
3720 R  = (A1/X - B1)/C1: R = R*100: RETURN
3730 P0 = A1/(C1*X + B1):            RETURN
3740 !
3750 !   PRINT TABLE LINE - OPTION 1
3760 !
3770 PRINT TAB(24) FMT(P0,M$); TAB(55); FMT(R,F$)
3780 RETURN
3790 !
3800 !   SET UP OUTPUT HEADINGS AND NUMERICAL DATA FORMAT - OPTION 2
3810 !
3820 IF C$ = "D" THEN K$ = U$: H$ = D$: RETURN
3830 IF C$ = "G" THEN K$ = T$: H$ = G$: RETURN
3840 IF C$ = "V" THEN K$ = U$: H$ = V$: RETURN
3850 IF C$ = "I" THEN K$ = U$: H$ = I$: RETURN
3860 IF C$ = "N" THEN K$ = F$: H$ = N$: RETURN
3870 IF C$ = "P" THEN K$ = U$: H$ = P$: RETURN
3880 IF C$ = "O" THEN K$ = U$: H$ = O$: RETURN
3890 IF C$ = "E" THEN K$ = U$: H$ = E$: RETURN
3900 INPUT "SYMBOL NOT CORRECT - WANT TO TRY AGAIN (Y/N)?";Q$
3910 IF Q$ = "Y" AND Z = 2 GOTO 3100
3920 IF Q$ = "Y" AND Z = 4 GOTO 3170
3930 GOTO 4710
3940 !
3950 !   PRINT TABLE HEADING - OPTION 2
3960 !
3970 PRINT TAB(17) L$; TAB(34); R$; TAB(52); H$: PRINT
3980 RETURN
3990 !
4000 !   SET INPUT PARAMETER EQUAL TO INPUT VALUE - OPTIONS 2 & 4
4010 !
4020 IF C$ = "D" THEN D = C/100: RETURN
4030 IF C$ = "G" THEN G = C:     RETURN
4040 IF C$ = "V" THEN V = C/100: RETURN
4050 IF C$ = "I" THEN I = C/100: RETURN
4060 IF C$ = "N" THEN N = C:     RETURN
4070 IF C$ = "P" THEN P = C/100: RETURN
4080 IF C$ = "O" THEN O = C:     RETURN
4090 IF C$ = "E" THEN E = C/100: RETURN
4100 !
4110 !   PRINT TABLE LINE - OPTION 2
4120 !
4130 NO = 50 + INT(LEN(H$)/2) - INT(LEN(K$)/3)
4140 PRINT TAB(18) FMT(P0,M$); TAB(37); FMT(R,F$); TAB(NO); FMT(C,K$)
4150 RETURN
4160 !
4170 !   RESET INPUT PARAMETER VALUE TO INITIAL INPUT VALUE - OPTIONS 2 & 4
4180 !
4190 IF C$ = "D" THEN D = D9: RETURN
4200 IF C$ = "G" THEN G = G9: RETURN
4210 IF C$ = "V" THEN V = V9: RETURN
4220 IF C$ = "I" THEN I = I9: RETURN
4230 IF C$ = "N" THEN N = N9: RETURN
4240 IF C$ = "P" THEN P = P9: RETURN
4250 IF C$ = "O" THEN O = O9: RETURN
4260 IF C$ = "E" THEN E = E9: RETURN
4270 RETURN
4280 !
4290 !   PRINT PLOT ORDINATE HEADING AND SCALE DATA - OPTIONS 3 & 4
4300 !
4310 PRINT TAB(36) R$: PRINT
4320 PRINT TAB(15) "0  1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19";
     " 20"
4330 PRINT TAB(7) FMT(X,A$); " "; REPEAT$(Y$,61)
4340 RETURN
4350 !
4360 !   PRINT PLOT LINE WITH ABSCISSA SCALE - OPTION 3
4370 !
4380 IF J > L2 AND J <= (L1 + L2) GOTO 4400
4390 PRINT TAB(N4+3); FMT(X,A$); " !"; TAB(P1); "*": GOTO 4410
4400 PRINT TAB(N4) MID$(L$,L,1); "  "; FMT(X,A$); " !"; TAB(P1); "*": L = L + 1
4410 RETURN
4420 !
4430 !   PRINT PLOT LINE WITHOUT ABSCISSA SCALE - OPTION 3
4440 !
4450 IF J > L2 AND J <= (L1 + L2) GOTO 4470
4460 PRINT TAB(N4+11); "!"; TAB(P1); "*": GOTO 4480
4470 PRINT TAB(N4) MID$(L$,L,1); "          !"; TAB(P1); "*": L = L + 1
4480 RETURN
4490 !
4500 !   PRINT PLOT LINE WITH ABSCISSA SCALE - OPTION 4
4510 !
4520 IF K > L2 AND K <= (L1 + L2) GOTO 4540
4530 PRINT TAB(N4+3); FMT(X,A$); " !"; TAB(P1); "*"; TAB(P2); "*"; TAB(P3);
     "*": GOTO 4550
4540 PRINT TAB(N4) MID$(L$,L,1); "  "; FMT(X,A$); " !"; TAB(P1); "*"; TAB(P2);
     "*"; TAB(P3); "*": L = L + 1
4550 RETURN
4560 !
4570 !   PRINT PLOT LINE WITHOUT ABSCISSA SCALE - OPTION 4
4580 !
4590 IF K > L2 AND K <= (L1 + L2) GOTO 4610
4600 PRINT TAB(N4+11); "!"; TAB(P1); "*"; TAB(P2); "*"; TAB(P3); "*": GOTO 4620
4610 PRINT TAB(N4) MID$(L$,L,1); "          !"; TAB(P1); "*"; TAB(P2); "*";
     TAB(P3); "*": L = L + 1
4620 RETURN
4630 !
4640 !   PRINT LABELS FOR EACH PLOT - OPTION 4
4650 !
4660 IF C$ = "G" OR C$ = "O" C2 = C2/1000: C3 = C3/1000: C4 = C4/1000
4670 IF C$ = "G" H$ = "ANNUAL GROSS INCOME (1000$)"
4680 IF C$ = "O" H$ = "ANNUAL OPERATING EXP. (1000$)"
4690 PRINT TAB(P1-1); FMT(C2,B$); TAB(P2-1); FMT(C3,B$); TAB(P3-1); FMT(C4,B$)
4700 PRINT: PRINT TAB(45 - LEN(H$)/2) H$: RETURN
4710 END
```

California Digital

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Introducing the

ANACOM 150

DOT MATRIX PRINTER

Mfg. suggested list $1350

California Digital Introductory Price

$995

Full 136 Characters for the price of 80

DURABILITY... is the key component of the new Anacom 150. No bells, no whistles, no problems, just consistent high quality output.

This nine wire dot matrix printer features a ballistic type print mechanism guaranteed for three million characters. Low count (15) integrated circuits add to the reliability of the printer.

Microprocessor controlled logic seeking bi-directional head allows the Anacom to print up to speeds of 150 characters per second. 136 columns wide.

Adjustable tractors and variable head gap permit the Anacom to accept fifteen inch wide multi-part forms.

Switch selectable: skip paper perforation, carriage return/line feed and six or eight lines per inch.

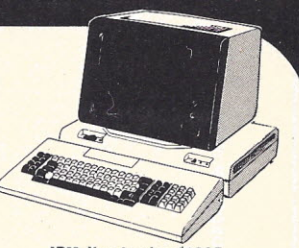
Lexan paper shield and enclosure sound proofing add to the overall quality of the printer.

The Anacom 150 is definitely the best value in todays extremely competitive world of micro-printers.

If you are in the market for a "Quality Engineered" dot matrix printer, please consider the Anacom 150 before purchasing a less reliable machine.

Available either RS-232 serial 9600 baud, PRA-150S or Centronic parallel PRA-150P. Field exchange. UPS shipping weight 40 pounds.

IBM 3101 DISPLAY TERMINAL



The new 3101 display terminal is the IBM entry into the plug compatable micro computer industry.

This modularly constructed CRT terminal has been engineered with the user in mind. The video display modules swivels and tilts to provide the operator with a comfortable viewing posture.

Twelve inch P-39 green phosphor screen boasts a crisp 7 by 14 character matrix.

Standard 80 by 24 line screen format with a 25th line to display machine status and aid in the diagnostics in the event of a system malfunction.

87 key Selectric style keyboard arrangement along with numeric entry pad. Eight user definable function keys.

The 3101 video terminal is RS232 compatable and displays all 128 ASCII characters including control codes.

Accessible customer setup switches aid in choosing such options as line speed, parity scroll, and reverse video.

But most of all, built into every 3101 terminal is the quality that you have learned to expect from the IBM Corporation. VDT-3101

IBM direct price $1295

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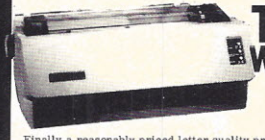
forty track

NEC Spinwriter 5510P/S $2495

The word processing quality Spinwriter prints at speeds upto 55 characters per second. The Model 5510 P/S is supplied with both parallel and RS-232 serial interfacing. Also included is the tractor feed mechanism, along with print thimble and ribbon. PRN-5510PS 70 lbs. Keyboard (KSR) Model 5520 P/S available $2995. PRN-5520PS 75 lbs.

TEC V-300 Word Processing Daisy Wheel Printer $1595



Finally a reasonably priced letter quality printer... Bi-directional printing at 25 characters per second. Full 136 print positions wide. Proportional spacing 1/120" horizontal, 1/48" vertical.
Uses standard Diablo brand interchangable daisy print wheels.
Intel 8085 CPU microprocessor controlled. Interfaces via Centronics parallel connector. Shipping 58 lbs. PRV-300.

2716 EPROM SALE $13

We have slashed price in an effort to reduce our over stocked inventory. These are single five volt EPROMs manufactured by one of the Worlds largest producers of semiconductors. All are first quality prime devices. Ceramic 450 nS.

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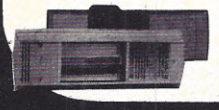
UV EPROM ERASER



With purchase of One Hundred 2716 EPROM's $79 value

AMPEX DIALOGUE 80 CRT TERMINAL $995

New from the Ampex Corporation. The Dialogue 80 features removable keyboard, displayable two pages (four optional) dual program keys, half intensity protected fields and status line. Transmits data either block, line or character mode. Excellent value. VDT-D80 shipping 47 lbs.

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Applied Digital Data Systems Inc.

REGENT 25 $850
80 character by 24 line twelve inch screen. 18 key numeric-entry cluster. Reverse video. Displayable control characters. VDT-R25 ship. 60 lbs.

REGENT 30 $950
Additional features. Special function keys. High resolution graphics. 25th status line. Multi-intensity screen. Superior quality keyboard. VDT-R30

REGENT 40 $1195
Insert/delete line feature. Eleven special graphic symbols. VDT-R40

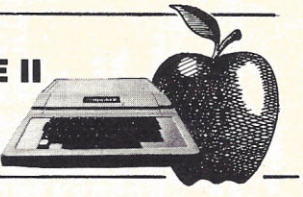
REGENT 60 $1495
Buffered display. Block mode transmission. Protected fields. VDT-R60

HEWLETT PACKARD $2650

HP 85

The Hewlett Packard HP-85 is a complete, low cost portable computer system. This self contained package includes CPU, keyboard, printer, CRT display and cassette tape drive. SYS-HP85 30 lbs.

APPLE II $988

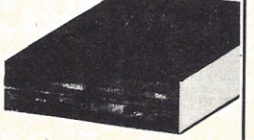


ATARI

800 $747

400 $695

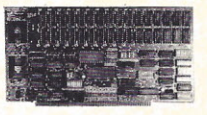
LOBO Disk Drives

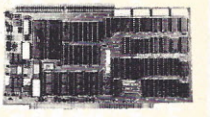


The package includes a durable steel enclosure, Power One brand disk power supply, muffin exhaust fan and all the necessary harnessing cables.
The Lobo package with:
One Shugart SA801R disk drive... $795
Two Shugart SA801R disk drives. $1195

S-100 BOARDS

Assembled • Tested • Burned-in





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CALIFORNIA DIGITAL	
8088 CPU 4K on board static RAM	450

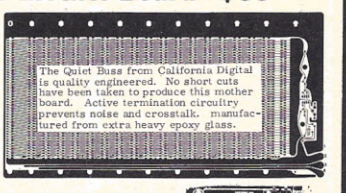
S-100 Mother Board $35

Quiet Buss™

8803-18

18 slot

IMSAI



The Quiet Buss from California Digital is quality engineered. No short cuts have been taken to produce this mother board. Active termination circuitry prevents noise and crosstalk. manufactured from extra heavy epoxy glass.

ACCESSORIES FOR THE APPLE COMPUTER

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Arithmetic Processor 7811 B/C	$319
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Connects directly to the new modular phone jack. Fully powered from your existing telephone line. No need to locate external AC power. Crystal control prevents frequency drift. Direct connect feature eliminates loss of information due to carbon compression that is associated with acoustic modems.

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A Population Projection Program
Continued from page 94

PROGRAM LISTING

```
1  REM  DISAGGREGATE POPULATION PROJECTION PROGRAM
2  DIM SX$(2),YR$(2)
3 SX$(1) = "FEMALES":SX$(2) = "  MALES"
6 D$ =  CHR$ (4): GOTO 15
7  HOME : VTAB 12: INPUT "     ARE YOU USING THE 1980 CENSUS? ";IN$
8  IF IN$ = "Y" OR IN$ = "YES" THEN 10
9 YR$(1) = "1960":YR$(2) = "1970": RETURN
10 YRS$(1) = "1970":YR$(2) = "1980": RETURN
15  GOSUB 7
20  HOME
30  PRINT "ANNUAL MIGRATION ESTIMATE AND POPULATION"
40  PRINT  SPC( 3);"PROJECTION PROGRAM"
50  PRINT : PRINT  SPC( 14);"WRITTEN BY:"
60  PRINT : PRINT  SPC( 9);"DR. WILLIAM E. MIHALO"
70  PRINT  SPC( 9);"DEPT. OF SOCIOLOGY"
80  PRINT  SPC( 9);"INDIANA UN NORTHWEST"
90  PRINT  SPC( 9);"3400 BROADWAY"
100  PRINT  SPC( 9);"GARY, INDIANA  46408"
110  PRINT
120  VTAB 21: INVERSE : INPUT "DO YOU WANT INSTRUCTIONS? ";IN$: NORMAL
130  IF IN$ = "Y" OR IN$ = "YES" THEN 150
140  GOTO 280
150  HOME : PRINT "     THIS PROGRAM REQUIRES A USER TO"
160  PRINT "ENTER CENSUS DATA THAT ARE BROKEN DOWN"
170  PRINT "BY AGE AND SEX. WHEN THESE DATA"
180  PRINT "ARE ENTERED, AN ANNUALIZED MIGRATION"
190  PRINT "ESTIMATE WILL BE COMPUTED. FOLLOWING"
200  PRINT "THIS, A SEX-SPECIFIC PROJECTION"
210  PRINT "OF THE POPULATION WILL BE COMPUTED"
220  PRINT "FOR A USER-SPECIFIED NUMBER OF YEARS."
230  PRINT : PRINT "DATA CAN BE ENTERED FOR ANY TYPE OF"
240  PRINT "POPULATION RANGING IN SIZE FROM AN EN-"
250  PRINT "TIRE COUNTRY TO A COMMUNITY OR EVEN A": PRINT "CENSUS TRACT."

270  PRINT : INVERSE : INPUT "HIT CARRIAGE RETURN WHEN READY ";CR$: NORMAL

280  VTAB 22: PRINT "     THIS PROGRAM MUST INPUT DATA FROM"
290  PRINT "ONE OF THREE POSSIBLE SOURCES. WE WILL"
300  PRINT "NOW PROCEED TO THE INPUT COMMAND MENU"
310  FOR TE = 1 TO 4000: NEXT TE
500  REM  INPUT ROUTINE AND VARIABLE INITIALIZATION
510  DIM SR(15,2),X1(15,2,2),T9(15,2),AG$(15),XE(15,2),EM(15,2),MR(115,2)
     ,E1(15,2),E2(15,2)
525 AG$(2) = "0"
527  GOSUB 5000
530  REM  SR=ARRAY CONTAINING CENSUS SURVIVAL RATES
540  REM   X1=ARRAY CONTAINING 1960 AND 1970
550  REM  OR 1970 AND 1980 POPULATIONS.
560  REM  AG$=STRING VECTOR OF AGE INTERVALS
570  REM  XE=ARRAY OF NUMBER OF PEOPLE LIVING TO NEXT CENSUS
580  REM  EM=ARRAY OF NUMBER OF MIGRANTS
590  REM  MR=ARRAY OF MIGRATION RATES
600  HOME : VTAB 12: PRINT "HOW MANY GEOGRAPHIC AREAS DO YOU INTEND"
610  INPUT "TO HAVE PROJECTED? ";NG
620  PRINT : INPUT "ARE YOU SURE? ";IN$
630  IF IN$ = "N" OR IN$ = "NO" THEN 600
635 SW = 0: REM  INPUT COMMAND SWITCH
640  HOME : PRINT  SPC( 12);"INPUT COMMANDS:": PRINT
650  PRINT  SPC( 4);"1. ENTER DATA FROM KEYBOARD"
660  PRINT  SPC( 4);"2. ENTER DATA FROM CASSETTE TAPE"
670  PRINT  SPC( 4);"3. ENTER DATA FROM DISK"
1370  RECALL X1
1380 SW = 1
1390  PRINT : HTAB 14: FLASH : PRINT "TAPE LOADED": NORMAL :
1395  FOR TE = 1 TO 5000: NEXT TE: GOTO 640
1400  HOME : REM  ENTER DATA FROM DISK
1420  PRINT  SPC( 9);"INPUT DATA FROM DISK"
1430  PRINT : INPUT "ENTER FILE NAME ";IN$
1440  PRINT D$;"OPEN ";IN$
1450  PRINT D$;"READ ";IN$
1460  FOR J = 1 TO 2
1470  FOR I = 1 TO 2
1480  FOR K = 1 TO 15
1490  INPUT X1(K,I,J)
1500  NEXT K
1510  NEXT I
1520  NEXT J
1530  PRINT D$;"CLOSE ";IN$
1540 SW = 1: GOTO 640
1550  HOME : REM  VERIFY, SAVE, EDIT.
1560  PRINT  SPC( 8);"DATA CORRECTION COMMANDS"
1570  PRINT : PRINT  SPC( 4);"1. DISPLAY DATA ONLY"
1580  PRINT  SPC( 4);"2. DISPLAY AND CORRECT DATA"
1590  PRINT  SPC( 4);"3. SAVE DATA ON TAPE"
1600  PRINT  SPC( 4);"4. SAVE DATA ON DISK"
1610  PRINT  SPC( 4);"5. TRANSMIT DATA VIA COMM CARD"
1620  PRINT  SPC( 4);"6. RETURN TO INPUT COMMAND MENU"
1630  PRINT : PRINT  SPC( 4);: INPUT "WHICH COMMAND DO YOU WISH TO RUN? "
     ;IN$
1640 IC =  VAL (IN$):SN = 0
1650  IF IC <  = 0 OR IC > 6 THEN 1550
1660  ON IC GOTO 1680,1680,1950,2010,1675,640
1670  REM
1675  INPUT "ENTER THE COMM CARD SLOT NUMBER ";SN
1680  FOR J = 1 TO 2
1700  FOR I = 1 TO 2
1704  HOME
1705  PRINT "DATA LISTING FOR ";YR$(J);
1710  PRINT  SPC( 1);SX$(I);" POPULATION": PRINT : PRINT : POKE 34,3
1720  HOME
1725  FOR K = 1 TO 15:TE = 0
1727  IF K < 10 THEN TE = 1
1730  PRINT  SPC( TE);K; SPC( 2);AG$(K); SPC( 1);
1740  PR# SN: PRINT X1(K,I,J): PR# 0
1750  NEXT K
1760  IF IC = 2 THEN 1780
1770  PRINT : INPUT "     HIT RETURN FOR MORE DATA ";CR$: GOTO 1920
1780  PRINT : PRINT "ENTER THE INDEX NUMBER OF THE AGE-GROUP"
1790  PRINT "THAT YOU WISH TO CHANGE.  IF YOU DO"
1800  PRINT "NOT WISH TO CHANGE ANYTHING,"
1810  INPUT "ENTER A ZERO. ";IN$
1820 TE =  VAL (IN$)
1830  IF TE <  = 0 OR TE > 15 THEN 1920
1840  VTAB 20: PRINT "YOU HAVE INDICATED THAT YOU WISH TO     "
1850  PRINT "CHANGE DATA FOR THE ";AG$(TE);" AGE GROUP."
1860  PRINT "IF YOU DON'T WISH TO CHANGE DATA, ENTER"
1870  INPUT "A NEGATIVE NUMBER. ";H1
1880  IF H1 < 0 THEN 1720
1890 X1(TE,I,J) = H1
1900  GOTO 1720
1920  POKE 34,0: HOME : NEXT I
1930  NEXT J
1940  GOTO 1550
1950  GOSUB 6010: GOTO 1550
2010  GOSUB 7000: GOTO 1550
2150 SW = 0: REM  COMPUTE MIGRATION ESTIMATES
2160  HOME : PRINT "DATA PROJECTION PHASE. EST OF MIGRATION"
2170  PRINT : PRINT  SPC( 4);"1. DISPLAY MIGRATION RATES"
```

```
680  PRINT  SPC( 4);"4. VERIFY, SAVE, OR EDIT RAW DATA"
690  PRINT  SPC( 4);"5. INITIATE PROJECTION OF DATA"
700  PRINT  SPC( 4);"6. ABORT PROGRAM "
710  PRINT : INPUT "     WHICH COMMAND DO YOU WISH TO RUN? ";IN$
720 IC =  VAL (IN$)
730  IF IC <  = 0 OR IC > 6 THEN 780
740  IF IC = 4 AND SW = 0 THEN 800
750  IF IC = 5 AND SW = 0 THEN 810
770  ON IC GOTO 850,1250,1400,1550,2150,4730
780  FLASH : VTAB 10: PRINT "NO!": VTAB 14: PRINT "YOU MUST ENTER A NUMBE
     R BETWEEN 1 & 5."; CHR$ (7): NORMAL
790  FOR TE = 1 TO 4500: NEXT TE: GOTO 640
800  FLASH : VTAB 6: PRINT "NO!": GOTO 830
810  FLASH : VTAB 7: PRINT "NO!"
830  VTAB 14: PRINT  SPC( 4);"NO DATA HAS BEEN ENTERED INTO PRO-"
840  PRINT  SPC( 4);"GRAM. YOU CANNOT RUN THIS COMMAND!"; CHR$ (7): NORMAL
     : FOR TE = 1 TO 4500: NEXT TE: GOTO 640
850  HOME : PRINT  SPC( 7);"DATA ENTRY FROM KEYBOARD":
860  FLASH : PRINT : PRINT "WARNING! FEMALES MUST BE ENTERED FIRST"; CHR$
     (7); CHR$ (7); CHR$ (7)
870  PRINT "INTO THE DATABASE.   IF YOU FAIL TO DO"; CHR$ (7)
880  PRINT "THIS,  THE SUBSEQUENT PROJECTIONS MADE"; CHR$ (7)
890  PRINT "BY THIS PROGRAM WILL BE ERRONEOUS.": NORMAL
900  VTAB 10: INPUT "DO YOU UNDERSTAND THIS? ";IN$
910  IF IN$ = "YES" OR IN$ = "Y" THEN 930
920  GOTO 850
930  VTAB 10: PRINT "WHICH SEX IS ENTERED INTO THE DATABASE": INPUT "FIRS
     T, MALES OR FEMALES? ";IN$
940  IF IN$ = "WOMEN" OR IN$ = "FEMALES" OR IN$ = "GIRLS" THEN 960
950  GOTO 850
960  HOME : IF  VAL (AG$(2)) = 5 THEN 1040
965  GOTO 1040
1040 LN = 1: GOTO 1120
1050  HOME : PRINT  SPC( 3);YR$(1); SPC( 1);"POPULATION COUNT FOR FEMALES
     ": GOTO 1090
1060  HOME : PRINT  SPC( 4);YR$(1); SPC( 1);"POPULATION COUNT FOR MALES":
      GOTO 1090
1070  HOME : PRINT  SPC( 3);YR$(2); SPC( 1);"POPULATION COUNT FOR FEMALES
     ": GOTO 1090
1080  HOME : PRINT  SPC( 4);YR$(2); SPC( 1);"POPULATION COUNT FOR MALES"
1090  PRINT : PRINT "ENTER APPROPRIATE COUNT FOR EACH AGE":LN = LN + 1
1100  PRINT "INTERVAL. PLEASE OMIT COMMAS.": RETURN
1110  REM  PREPARE MAIN DATA INPUT LOOPS
1120  FOR J = 1 TO 2: REM  OUTSIDE LOOP IS FOR YEAR
1130  FOR I = 1 TO 2: REM  SEX
1140  IF LN < 5 THEN  GOTO 1160
1150  GOTO 1170
1160  ON LN GOSUB 1050,1060,1070,1080
1170  FOR K = 1 TO 15
1180  PRINT AG$(K);: INPUT " ";X1(K,I,J)
1190  NEXT K
1200  NEXT I
1210  NEXT J
1220 SW = 1
1230  GOTO 640: REM   ALL DATA ARE ENTERED:REM RETURN TO INPUT MENU.
1240  REM  INPUT DATA FROM CASSETTE TAPE
1250  HOME : PRINT  SPC( 5);"INPUT DATA FROM CASSETTE TAPE"
1260  PRINT : PRINT "DATA MUST BE ENTERED BY GEOGRAPHIC DIV-"
1270  PRINT "ISION. IF YOU HAVE ONLY ONE GEOGRAPHIC"
1280  PRINT "AREA, THIS WOULD BE YOUR ONLY ENTRY."
1290  PRINT : PRINT "IF YOU HAVE MORE THAN ONE GEOGRAPHIC"
1300  PRINT "AREA, YOU MUST LET THE PROGRAM CONTINUE"
1310  PRINT "THROUGH THE MIGRATION ESTIMATION"
1315  PRINT "AND POPULATION PROJECTION PHASES."
1320  FOR TE = 1 TO 4500: NEXT TE
1330  VTAB 16: PRINT "START RECORDER. HIT CARRIAGE RETURN TO"
1340  PRINT "READ TAPE. HIT ANY OTHER KEY TO ABORT. ": GET IN$
1350  IF  ASC (IN$) = 13 THEN 1370
1360  GOTO 640
```

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2180  PRINT  SPC( 4);"2. SAVE MIGRATION RATES ON TAPE"
2190  PRINT  SPC( 4);"3. SAVE MIGRATION RATES ON DISK"
2200  PRINT  SPC( 4);"4. TRANSMIT RATES VIA COMM CARD"
2210  PRINT  SPC( 4);"5. ENTER LAST PHASE OF PROJECTION"
2220  PRINT  SPC( 4);"6. RETURN TO INPUT COMMAND MENU"
2230  VTAB 10: PRINT  SPC( 4);: INPUT "WHICH COMMAND DO YOU WISH TO RUN?
     ";IN$
2240 IC =  VAL (IN$):SN = 0
2250  IF IC <  = 0 OR IC > 6 THEN 2160
2255  IF IC = 5 THEN 3360
2260  IF IC = 4 THEN 2280
2265  IF IC = 6 THEN 640
2270  GOTO 2305
2280  INPUT "ENTER THE COMM CARD SLOT NUMBER ";SN
2300  REM  READ CENSUS SURVIVAL RATES
2305  RESTORE
2310  FOR K = 1 TO 15
2320  READ SR(K,1),SR(K,2)
2330  NEXT K: REM  WHITE DATA ONLY
2420 II = 12:B1 = 0:B2 = 0
2430  FOR I = 1 TO 2
2440  FOR K1 = 1 TO II
2450 I2 = K1 + 2
2460 XE(I2,I) = X1(K1,I,1) * SR(K1,I)
2470  NEXT K1
2480 IX = II + 1
2490 ST = 0.0
2500 XE(15,I) = 0.0
2510  FOR K = IX TO 15
2520 XE(15,I) = (X1(K,I,1) * SR(K,I)) + XE(15,I)
2530  NEXT K
2540  ON I GOTO 2550,2600
2550 XS = 0.0:XT = 0.0
2560  FOR K = 4 TO 10
2570 XS = XS + X1(K,I,1)
2580 XT = XT + XE(K,I)
2590  NEXT K
2600  IF XS > 0.0 THEN 2640
2610 V1 = 0.0
2620 V2 = 0.0
2630  GOTO 2660
2640 V1 = (X1(1,I,1) / XS) * XT
2650 V2 = (X1(2,I,1) / XS) * XT
2660 XE(1,I) = V1
2670 XE(2,I) = V2
2680  FOR K = 1 TO 15
2690 EM(K,I) = X1(K,I,2) - XE(K,I)
2700  NEXT K
2710  HOME : REM  OUTPUT TABLE
2720  PRINT  SPC( 06);"MIGRATION RATES FOR ";SX$(I)
2730  PRINT : PRINT " AGE"; SPC( 2);YR$(1)" POP"; SPC( 1);
2740  PRINT YR$(2);" POP"; SPC( 1);"MIG EST"; SPC( 1);
2750  PRINT "MIG RATE"
2760  FOR K = 1 TO 15
2770  IF XE(K,I) <  = 0.0 AND EM(K,I) <  = 0.0 THEN MR(K,I) = 0.0: GOTO 3
     030
2780  IF XE(K,I) <  = 0.0 THEN MR(K,I) = 0.0717735: GOTO 3030
2790  IF X1(K,I,2) <  = 0.0 THEN MR(K,I) =  - 0.066967: GOTO 3030
2800 MR(K,I) = ((X1(K,I,2) / XE(K,I)) ^ 0.10) - 1.0
2810  IF MR(K,I) > 0.0717735 THEN MR(K,I) = 0.0717735
2820  IF MR(K,I) <  - 0.066967 THEN MR(K,I) =  - 0.066967
2830  REM  FILL CELLS IN TABLE
3030  PRINT AG$(K); SPC( 1);
3040 N = 1:S = 7
3050  FOR J = 1 TO 2
3060 X = X1(K,I,J)
3070  GOSUB 8010
3080  PRINT  SPC( 1);
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```
3090  NEXT J
3095 S = 6
3100 X = EM(K,I)
3110  GOSUB 8010
3120  PRINT  SPC( 1);
3130 N = 4:S = 6
3140  PR# SN:X = MR(K,I): GOSUB 8010)
3150  PRINT : PR# 0
3160  NEXT K
3164  PRINT : PRINT
3165  PRINT "      ";
3170  INPUT "HIT RETURN FOR NEXT LISTING ";CR$
3180  NEXT I
3190  IF IC > 3 THEN IC = 1
3200  ON IC GOTO 2160,3210,3235
3210  INPUT "START TAPE RECORDER; HIT RETURN ";CR$
3220  STORE MR
3230  GOTO 2160
3235  GOSUB 9000
3350  HOME : REM  FINAL PROJECTIONS
3360  PRINT  SPC( 8);"FINAL PROJECTION PHASE"
3370  PRINT : PRINT "ENTER THE NUMBER OF YEARS FOR THE"
3380  INPUT "PROJECTIONS. ";Y2
3390  IF Y2 = 0 OR Y2 > 15 THEN 3350
3400  PRINT : PRINT "DO YOU WANT TABLE OUTPUT FOR EACH"
3410  INPUT "YEAR?      ";IN$
3420 TA = 0
3430  IF IN$ = "YES" OR IN$ = "Y" THEN TA = 1
3440  IF TA = 0 THEN 3460
3450  GOTO 3480
3460  PRINT : PRINT "A TABLE WILL BE PRINTED FOR THE LAST"
3470  PRINT "YEAR IN THE PROJECTION CYCLE"
3480  PRINT : INPUT "PLEASE HIT RETURN ";CR$
3485  HOME : PRINT  SPC( 2);"POPULATION PROJECTION COMMANDS"
3490  VTAB 3: PRINT  SPC( 4);"1. DISPLAY PROJECTION DATA          "
3500  PRINT  SPC( 4);"2. SAVE PROJECTION DATA ON TAPE"
3510  PRINT  SPC( 4);"3. SAVE PROJECTION DATA ON DISK"
3520  PRINT  SPC( 4);"4. RETURN TO INPUT COMMAND MENU"
3530  PRINT : PRINT  SPC( 4);: INPUT "WHICH COMMAND DO YOU WISH TO RUN? "
    ;IN$
3540 IC =  VAL (IN$)
3550  IF IC <  = 0 OR IC > 4 THEN 3490
3560  IF IC = 4 THEN 640
3570 Y1 =  VAL (YR$(2)):Y2 =  VAL (YR$(2)) + (Y2 - 1)
3820  REM  ANNUALIZE SURVIVAL RATES AND TRANSFER Y1
3822  REM  DATA TO TEMPORARY LOCATION
3830  FOR I = 1 TO 2
3840  FOR K = 1 TO 15
3850 SR(K,I) = SR(K,I) ^ 0.10
3850  REM  XE ARRAY IS SIZE OF CHILDBEARING POP FOR EACH PROJECTED YEAR.
3870 XE(K,I) = 0.0
3880 EM(K,I) = X1(K,I,2)
3890 X1(K,I,1) = X1(K,I,2):XT = XT + X1(K,I,1)
3900  NEXT K
3910  NEXT I
3920 XS = 0.0
3930  REM  COMPUTE SIZE OF CHILDBEARING POP
3940  FOR I = 1 TO 2
3950  IF I = 2 THEN 4010
3960  FOR K = 4 TO 10
3970 XS = XS + X1(K,I,1)
3980  NEXT K
3990  IF XS <  = 0.0 THEN C1 = 0.0
4000  IF XS <  = 0.0 THEN 4030
4010  IF I = 2 AND XS <  = 0.0 THEN 4030
4020 C1 = X1(1,I,1) / XS:XT = 0.0:XY = 0.0
4695 P1 = 100: IF XT = 0 THEN X = 100: GOTO 4720
4700 P1 = ((XY - XT) / XT) * 100
4720 N = 2:X = P1: GOSUB 8010: PRINT
4721  PRINT
4722  INPUT "      HIT RETURN FOR NEXT LISTING ";CR$
4725  NEXT I
4730  IF IC = 2 THEN  GOSUB 6010
4740  IF IC = 3 THEN  GOSUB 7000
4750 NG = NG - 1
4760  IF NG <  = 0 THEN 4780
4770  GOTO 640
4780  END
5000  FOR I = 1 TO 15: READ T9(2,2),T9(2,2): NEXT I
5010  FOR I = 1 TO 15: READ AG$(I): NEXT I: RETURN
5015  REM   1950-1970 NATIONAL CENSUS SURVIVAL RATES.
5016  REM  RATES ARE FOR "ALL CLASSES" BUT BROKEN
5017  REM  DOWN BY SEX.
5020  DATA  1.00029,1.00504,1.00803,1.00538
5030  DATA  0.99802,0.98144,0.99341,0.95850
5040  DATA  1.00339,0.98608,0.99575,0.97867
5050  DATA  0.98697,0.96894,0.96270,0.94297
5060  DATA  0.95954,0.92824,0.93324,0.87995
5070  DATA  0.93262,0.84299,0.89211,0.75093
5080  DATA  0.83259,0.67482,0.67687,0.52831
5090  DATA  0.41490,0.31014
5095  REM  AGE-INTERVAL DATA
5100  DATA  "00-04","05-09","10-14","15-19"
5110  DATA  "20-24","25-29","30-34","35-39"
5120  DATA   "40-44","45-49","50-54","55-59"
5130  DATA  "60-64","65-69","70- +"
6000  REM  SAVE DATA SUBROUTINE--CASSETTE TAPE
6010  INPUT "START TAPE RECORDER. RETURN WHEN READY ";IN$
6020  REM
6030  STORE X1: RETURN
7000  PRINT "ENTER THE NAME OF THE FILE THAT YOU"
7010  INPUT "WANT SAVED ON DISK ";IN$
7020  PRINT D$;"OPEN ";IN$
7030  PRINT D$;"WRITE ";IN$
7040  FOR J = 1 TO 2
7050  FOR I = 1 TO 2
7060  FOR K = 1 TO 15
7070  PRINT X1(K,I,J)
7080  NEXT K
7090  NEXT I
7100  NEXT J
7110  PRINT D$;"CLOSE ";IN$
7120  RETURN
8000  REM  OUTPUT FORMAT SUBROUTINE
8001  REM  ROUTINE WRITTEN BY J. CROSSLEY
8002  REM  APPEARED IN "CONTACT 6" 10/79
8003  REM   MODIFIED BY W. E. MIHALO
8010  IF  LEN ( STR$ ( ABS ( INT (X)))) + N + 1 > S THEN S =  LEN ( STR$
    ( INT (X))) + N + 2
8015 X$ = " " +  STR$ ( INT (X * 10 ^ N + .5))
8020 Q =  LEN (X$) - ( VAL (X$) < 0)
8030  PRINT  SPC( S - Q * (Q > N + 1) - (N + 2) * (Q <  = N + 1));
8040  PRINT  MID$ (X$,1 + ( VAL (X$) < 0),(Q <  = N) + (Q - N) * (Q > N))
    ;
8050  PRINT  MID$ ("0.00",1 + ((N + 1) < Q),1 + (N - Q + 2) * (Q < N + 2)
    );
8060  PRINT  RIGHT$ (X$,N * (Q > N) + (Q - 1) * (Q <  = N));
8070  RETURN
9000  PRINT "ENTER THE NAME OF THE FILE THAT YOU"
9010  INPUT "WANT SAVED ON DISK";IN$
9020  PRINT D$;"OPEN ";IN$
9030  PRINT D$;"WRITE ";IN$
9040  FOR I = 1 TO 2
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4030  FOR Y3 = Y1 TO Y2
4040 Y4 = Y3 + 1:Y5 = (Y2 - Y3) + 1
4050  FOR K = 1 TO 15
4060  GOSUB 10000
4180  NEXT K
4185 XY = 0
4190  FOR K = 2 TO 15
4200 X1(K,I,2) = T9(K,I) * SR(K,I)
4210  REM  E1=MIGRATION ESTIMATE
4220 E1(K,I) = X1(K,I,2) * MR(K,I)
4230 E2(K,I) = X1(K,I,2) + E1(K,I):XY = XY + E2(K,I)
4240  NEXT K
4250  IF I = 2 THEN 4300
4260 XE(Y5,I) = 0.0
4270  FOR K = 4 TO 10
4280 XE(Y5,I) = XE(Y5,I) + X1(K,I,2)
4290  NEXT K
4300 X1(1,I,2) = C1 * XE(Y5,1)
4310 E1(1,I) = X1(1,I,2) * MR(1,I)
4320 E2(1,I) = X1(1,I,2) + E1(1,I):XY = XY + E2(1,I)
4330  REM  OUTPUT DATA
4340  IF TA = 0 THEN 4500: REM  SKIP INTERMEDIATE TABLES
4350  HOME : PRINT "POPULATION PROJECTIONS FOR ";SX$(I); SPC( 1);Y4 - Y1
4360  PRINT : PRINT " AGE"; SPC( 2);Y3; SPC( 1);"POP ";Y4; SPC( 1);"POP "
     ;"EST MIG ";"FIN EST"
4370  REM
4380 N = 1:S = 7
4385  PRINT
4390 XT = 0
4410  FOR K = 1 TO 15
4420  PRINT AG$(K); SPC( 1);
4430 X = X1(K,I,1):XT = XT + X1(K,I,1)
4440  GOSUB 8010
4450 X = X1(K,I,2): GOSUB 8010
4460 S = 7:X = E1(K,I): GOSUB 8010
4470 S = 7:X = E2(K,I): GOSUB 8010
4475  PRINT
4480  NEXT K
4482 N = 1:S = 8: PRINT "TOTAL";
4483 X = XT: GOSUB 8010
4484  PRINT  SPC( 15);:X = XY: GOSUB 8010
4488  PRINT
4490  VTAB 23: INPUT "CARRIAGE RETURN FOR NEXT TABLE ";CR$
4500  FOR K = 1 TO 15
4510 X1(K,I,1) = E2(K,I)
4520  NEXT K
4525  NEXT Y3
4530  HOME : PRINT "SUMMARY TABLE: ";SX$(I); SPC( 1);"POP PROJECTIONS"
4540  PRINT : PRINT " AGE"; SPC( 3);Y1; SPC( 1);"POP"; SPC( 1);Y2 + 1; SPC(
     1);"POP CHANGE  PERCENT"
4550  PRINT :XT = 0
4560  FOR K = 1 TO 15
4570  PRINT AG$(K); SPC( 1);
4580 S = 8:N = 1:X = EM(K,I): GOSUB 8010:XT = XT + EM(K,I)
4590 X = X1(K,I,1): GOSUB 8010
4600 S = 6:X = X1(K,I,1) - EM(K,I): GOSUB 8010
4605 P1 = 0
4610  IF EM(K,I) = 0 THEN X = 0: IF X = 0 THEN 4630
4620 P1 = (X / EM(K,I)) * 100
4630 N = 2:X = P1: GOSUB 8010:X1(K,I,1) = EM(K,I): PRINT
4640  NEXT K
4650  PRINT "TOTAL"; SPC( 1);
4660 S = 8:N = 1:X = XT: GOSUB 8010
4670 X = XY: GOSUB 8010
4680 S = 6:X = XY - XT: GOSUB 8010
4690 P1 = 0: IF XY = 0 AND XT = 0 THEN X = 0: IF X = 0 THEN 4720
9050  FOR K = 1 TO 15
9060  PRINT MR(K,I)
9070  NEXT K
9080  NEXT I
9090  PRINT D$;"CLOSE ";IN$
9100  RETURN
10000  REM     SUBROUTINE RECTAN:IF K=1 THEN 10020
10010  GOTO 10040
10020 T9(1,I) = X1(K,I,1)
10030  RETURN
10040 JA = K - 1.0
10050  IF K = 15 THEN 10070
10060  GOTO 10090
10070 T9(K,I) = (X1(JA,I,1) * 0.20) + X1(K,I,1)
10080  RETURN
10090 T9(K,I) = (X1(JA,I,1) * 0.20) + (X1(K,I,1) * 0.80)
10100  RETURN
```

Final printout of projections of population based on 1970 census data.

```
SUMMARY TABLE: FEMALES POP PROJECTIONS

 AGE   1970 POP 1982 POP CHANGE  PERCENT

00-04    4470.0   4065.4 -404.6  -9.05
05-09    5081.0   3826.4-1254.6 -24.69
10-14    5533.0   3785.0-1748.0 -31.59
15-19    5204.0   4068.2-1135.8 -21.83
20-24    4751.0   4406.0 -345.0  -7.26
25-29    3344.6   4256.2  911.6  27.26
30-34    2861.4   3598.5  737.0  25.76
35-39    2971.4   3079.8  108.3   3.65
40-44    3118.6   2593.3 -525.3 -16.84
45-49    3743.4   2493.6-1249.8 -33.39
50-54    3639.6   2617.8-1021.8 -28.07
55-59    3042.0   2712.7 -329.3 -10.82
60-64    2217.0   2471.5  254.5  11.48
65-69    1755.3   1927.3  172.0   9.80
70- +    1097.8   2027.2  929.4  84.66
TOTAL   52830.1  47928.7-4901.4  -9.28

     HIT RETURN FOR NEXT LISTING

SUMMARY TABLE:   MALES POP PROJECTIONS

 AGE   1970 POP 1982 POP CHANGE  PERCENT

00-04    4798.0   4374.5 -423.5  -8.83
05-09    5426.0   4132.5-1293.5 -23.84
10-14    5734.0   4006.9-1727.1 -30.12
15-19    4903.0   3981.5 -921.5 -18.79
20-24    4233.0   3911.8 -321.2  -7.59
25-29    3394.4   3998.2  603.8  17.79
30-34    2975.6   3670.8  695.1  23.36
35-39    2858.8   3026.7  167.9   5.87
40-44    2927.2   2524.0 -403.2 -13.77
45-49    3493.9   2306.5-1187.5 -33.99
50-54    3423.1   2286.1-1136.9 -33.21
55-59    2988.0   2240.6 -747.4 -25.01
60-64    2231.0   1969.0 -262.0 -11.74
65-69    1460.0   1434.1  -25.9  -1.77
70- +    2229.4   2081.6 -147.8  -6.63
TOTAL   53075.4  45944.8-7130.6 -13.43

     HIT RETURN FOR NEXT LISTING
```

Program Locator
Continued from page 85

Program 1. Setup

```
10 REM SETUP PROGRAM
20 !"THIS PROGRAM REQUIRES THAT A LARGE TYPE 3 DATAFILE CALLED"
30 !"DISKFILE BE CREATED BEFORE RUNNING. DISKFILE WILL CONTAIN"
40 !"THE LIST OF ALL PROGRAMS AND ABOUT 3 BLOCKS OF STORAGE"
50 !"SPACE USED BY THE PROGRAMS FILE AND SEARCH. I USED 250 BLOCKS FOR"
60 !"DISKFILE. IF DISKFILE HAS NOT BEEN CREATED YET, DO SO NOW,"
70 !"OTHERWISE HIT RETURN."\INPUT D$
80 REM
90 DIM A$(8),B$(4),C$(39),A4$(14),A5$(14),A6$(13),A7$(14),A9$(15)
100 DIM B1$(40),C0$(192),D1$(1),L1$(8),LZ$(4),L3$(39)
110 REM
120 L1$="          "\L2$="     "\L3$="
130 L4$="DISKFILE"\B1$="OTHER    ASSEMBLY BASIC  DATAFILE IBASIC  "
140 A1$=" RECORD #:"\A2$=" NAME:"\A3$=" DISK #:"\A4$=" VARIETY CODE:"
150 A5$=" PROGRAM TYPE:"\A6$=" SOURCE CODE "\A7$=" HEX LOCATION:"
160 A8$=" LENGTH:"\A9$=" DESCRIPTION:"
170 C0$(1,48)=" DELETED       GAMES      DIAGNOSTICS CURVE FITS  "
180 C0$(49,96)="SIMULATIONS    MATH       DISK INDEX  SPECTRO      "
190 C0$(97,144)="BIOPHYS CALCBASIC PROGMSPDS ASSMBLERSORTING PGMS"
200 C0$(145,192)="ELECTRONICS DIONEX EQUIP              UNCLASSIFIED"
210 REM
220 OPEN#0,L4$\WRITE#0 %200,A1$,A2$,A3$,A4$,A5$,A6$,A7$,A8$,NOENDMARK
230 WRITE#0 %303,A9$,B1$,C0$,L1$,L2$,L3$,L4$,NOENDMARK\CLOSE#0
240 REM
250 REM
260 REM DATALIST ENDS AT 615, PROGRAM LISTS START AT 700
270 REM
280 !"THIS PROGRAM IS DESIGNED TO SETUP THE FILE AND SEARCH PROGRAMS"
290 !"BY STORING ALL THE NECESSARY STRING VARIABLES IN THE DISKFILE."
300 !"TO CHANGE THE VARIETY CODES USED, LIST THIS PROGRAM AND CHANGE"
310 !"LINES 150-180. EACH CODE IS ALLOWED 12 SPACES."
320 !\!"THIS PROGRAM SHOULD BE USED BEFORE FILE OR SEARCH THE FIRST"
330 !"TIME THE PROGRAMS ARE USED, IN ORDER TO INITIALIZE THE "
340 !"STRING VARIABLES. IT DOESN'T HAVE TO BE USED AGAIN UNLESS"
350 !"THE VARIETY CODES ARE CHANGED."
360 INPUT"HIT RETURN TO GOTO THE FILE PROGRAM",D$
370 CHAIN "FILE"
380 END
```

Program 2. File

```
10 LINE 100
20 REM FILE PROGRAM
30 !"THIS PROGRAM ALLOWS ADDITIONS,DELETIONS AND CHANGES TO BE MADE"
40 !"TO DISKFILE."
50    DIM A$(8),B$(4),C$(39),A4$(14),A5$(14),A6$(13),A7$(14),A9$(15)
60    DIM B1$(40),C0$(192),D1$(1),L1$(8),L2$(4),L3$(39)
70 OPEN#0,"DISKFILE"\READ#0 %200,A1$,A2$,A3$,A4$,A5$,A6$,A7$,A8$
80 READ#0 %303,A9$,B1$,C0$,L1$,L2$,L3$,L4$\CLOSE#0
90   !TAB(25),"1   ADD A LISTING"
100  !TAB(25),"2   DELETE A LISTING"
670 !A1$,A,TAB(20),A2$," [",TAB(36),"]",\F=10\GOSUB930
680 INPUT" ",A$
690 !A3$," [   ]",\F=5\GOSUB930\INPUT" ",B\RETURN
700 GOSUB 960
710 !A4$,\INPUT " ",C\RETURN
720 !\FORD=0 TO 4\!%3I,D,"=",B1$((D+1)*8-7,(D+1)*8),\NEXT\!
730 INPUT"ENTER PROGRAM TYPE",D
740 IF D=1 THEN 760
750 G=0\B$=L2$\GOTO780
760 !"ENTER 1 FOR",A6$,"OR 0 FOR OBJECT CODE"\!A6$,\INPUT" ",G
770 !A7$,"    ]",\F=6\GOSUB930\INPUT" ",B$
780 !A8$,\INPUT" ",E\RETURN
790 !A9$,TAB(16),"[",TAB(56),"]",\F=41\GOSUB930\INPUT" ",C$\RETURN
800
810 REM ** SUB TO PRINT ENTRY **
820 !CHR$(27),CHR$(43)
830 !"1",TAB(10),A1$,A,TAB(30),A2$,A$,TAB(50),A3$,B
840 !"2",TAB(10),A4$,C0$(12*C+1,(C+1)*12)
850 !"3",TAB(10),A5$,B1$((8*D)+1,(D+1)*8)
860 IF D<>1THEN880
870 !TAB(10),A6$,\IFG=1THEN!"YES"ELSE!"NO"\!TAB(10),A7$,B$
880 !TAB(10),A8$;E
890 !"4",TAB(10),A9$;C$\RETURN
900
910   REM ** SUBROUTINE TO BACKSPACE **
920   REM CHR$(8) IS THE BACKSPACE CODE
930   FORI=1TOF\!CHR$(8),\NEXT\RETURN
940
950 REM ** PRINT VARIETY CODES **
960  I=0
970  FORJ=0TO15\I=I+1\!%5I,J,"=",C0$(J*12+1,(J+1)*12),
980  IF I=4 THEN I=0 ELSE 990\!
990  NEXT\!\RETURN
```

Program 3. Search

```
10 LINE 80
20 REM ** SEARCH PROGRAM **
30 X1$=CHR$(27)+CHR$(43)\!X1$\ REM ** CODES FOR CLEARING SCREEN **
40 DIM C$(39),A$(8),B$(4),N$(8),C0$(192),L4$(8),A9$(15),B1$(40)
50 L$="          "\L4$="DISKFILE"
60 OPEN#0,L4$\READ#0 %303,A9$,B1$,C0$\CLOSE#0
70  !"THIS PROGRAM ALLOWS DISKFILE (THE FILE CONTAINING A LIST OF"
80  !"ALL PROGRAMS) TO BE SEARCHED AND PROGRAMS MEETING CERTAIN "
90  !"CRITERIA TO BE LISTED."
100 GOTO 140
110 !CHR$(7),\ REM RINGS BELL TO SIGNAL END OF SEARCH
120 !"SEARCH COMPLETE"\INPUT"HIT RETURN TO CONTINUE",X$
130 !X1$
140 !\!"SEARCH BY:"
150   !TAB(30),"1   NAME"\!TAB(30),"2   DISK#"\!TAB(30),"3   VARIETY CODE"
160   !TAB(30),"4   SOURCE CODES"\!TAB(30),"5   LIST ALL PROGRAMS"
170   !TAB(30),"6   EXIT PROGRAM"\!TAB(30),"7   CHAIN FILE PROGRAM"
180 !"SELECT"\X=VAL(INCHAR$(0))
190 !X1$
200 OPEN#0,L4$\READ#0,N\CLOSE#0
210 ON X GOTO ZZ0,Z90,340,390,440,690,680
215
```

```
110  !TAB(25),"3   CHANGE A LISTING"
120  !TAB(25),"4   EXIT"
130  !TAB(25),"5   CHAIN SEARCH PROGRAM"\!
140  !"SELECT"\X=VAL(INCHAR$(0))
150       !CHR$(27),CHR$(43) \ REM CLEARS SCREEN
160  ON X GOTO190,390,580,630,620
170
180 REM ** SECTION TO ADD LISTING **
190 OPEN#0,L4$\READ#0,N,N1
195 IF N<1 THEN N=1
200 IFN1>0THEN Z10 ELSE A=N+1\N=N+1\GOTOZZ0
Z10 N1=N1-1\READ#0 %5*(N1+Z),A
220 GOSUB670\GOSUB700\GOSUB7Z0\GOSUB790
230 GOSUB 810
240 !\!\!"IS THIS CORRECT? ",\D1$=INCHAR$(0)\!D1$
250 IFD1$="Y"THEN330
260 INPUT"CHANGE WHICH LINE?",X
270 ON X GOTO 280,290,300,310
280  GOSUB670\GOTO230
290  GOSUB700\GOTO230
300  GOSUB720\GOTO230
310  GOSUB790\GOTO230
320
330 REM ** WRITE ENTRY INTO FILE **
340    A$=A$+L1$\B$=B$+L2$\C$=C$+L3$
350    WRITE#0 % 621+(A*79),A,A$,B,C,&G,B$,&D,E,C$,NOENDMARK\CLOSE#0
360    OPEN#0,L4$\WRITE#0,N,N1,NOENDMARK\CLOSE#0\GOTO90
370
380 REM ** SECTION TO DELETE LISTING **
390 !\ INPUT"DELETE WHICH RECORD #",A
400 OPEN#0,L4$\READ#0,N,N1
410 IF N>1 THEN 430
420 !"THERE ARE NO RECORDS TO DELETE"\GOTO 90
430 IF N1<=37 THEN 470
440 !\!"THERE ARE ALREADY 37 DELETED RECORDS.  YOU MUST"
450 !"ADD SOME PROGRAMS BEFORE DELETING ANY MORE OR YOU"
460 !"WILL OVERLAP THE STRING VARIBLE STORAGE AREA."\GOTO 90
470 READ#0 %621+(A*79),A,A$,B,C,&G,B$,&D,E,C$\GOSUB810
480 !\!\!
490 INPUT"DELETE THIS RECORD (Y OR N)?",Z$\CLOSE#0
500 IFZ$<>"Y"THEN90\N1=N1+1
510 OPEN#0,L4$\WRITE#0,N,N1,NOENDMARK
520 WRITE#0 %5*(N1+1),A,NOENDMARK
530 C$=L3$ \B$=L2$\B=0\C=0\A$="DELETED "
540 WRITE#0 % 6Z1+(A*79),A,A$,B,C,&G,B$,&D,E,C$,NOENDMARK
550 CLOSE#0
560 !\!A1$,A," HAS BEEN DELETED"\!\GOTO90
570
580 REM ** SECTION TO CHANGE LISTING **
590 !"ENTER THE RECORD# OF THE LISTING TO BE CHANGED:",
600 INPUT" ",A\OPEN#0,L4$\READ#0,N,N1
610 READ#0 %621+(A*79),A,A$,B,C,&G,B$,&D,E,C$\GOTO230
620 CHAIN "SEARCH"
630 END
640
650
660 REM ** ADD LISTING **
```

```
220 REM ** SORT BY NAME **
230 INPUT"ENTER FILENAME",N$\N$=N$+L$
240 GOSUB 480
250 OPEN #0,L4$\ FOR A=1 TO N
260 READ#0 %626+(A*79),A$
270 IF A$=N$ THEN GOSUB 540
280 NEXT \ CLOSE #0\ GOTO 110
285
290 REM ** DISK SORT **
300 INPUT"ENTER # OF DISK TO BE LISTED",Q
310 S=636
320 GOSUB 480
330 GOTO 580
335
340 REM ** VARIETY CODE SORT **
350 GOSUB 630
360 INPUT"SELECT CODE",Q
370 S=641
380 GOSUB 480\GOTO 580
385
390 REM ** SOURCE CODE SORT **
400 !\GOSUB 480
410 OPEN#0,L4$
420 FOR A=1 TO N\READ#0 %646+(A*79),&Q1
430 IF Q1=1 THEN GOSUB 540\ NEXT \!\CLOSE#0\ GOTO 110
440 REM ** LIST ALL PROGRAMS **
450 !\GOSUB 480\OPEN#0,L4$
460 FOR A=1 TO N\GOSUB 540\NEXT \!\ CLOSE#0\ GOTO 110
465
470 REM ** PRINT HEADING **
480 !TAB(14),"D"
490 !TAB(14),"I",  TAB(35),"T",TAB(37),    "S"
500 !TAB(14),"S",  TAB(35),"Y",TAB(37),    "I"
510 !TAB(14),"K",  TAB(35),"P",TAB(37),    "Z"
520 !"#   NAME       #   VARIETY       HEX E E          REMARKS"
522 !\RETURN
525
530 REM ** PRINT RECORD **
540 READ#0 %621+(A*79),A,A$,B,C,&G,B$,&D,E,C$
550 !%3I,A,TAB(4),A$,B," ",C0$(C*12+1,(C+1)*12),
560 !"  ",B$,D,E,TAB(40),C$\RETURN
565
570 REM ** READ NUMERIC VARIABLE FROM RECORD **
580 OPEN#0,L4$
590 FOR A=1 TO N
600 READ#0 %S+(A*79),Q1
610 IF Q1=Q THEN GOSUB 540
612 NEXT\!\CLOSE#0\GOTO110
615
620 REM ** PRINT VARIETY CODES **
630 I=0
640 FOR J=0 TO 15 \I=I+1
650 !%5I,J,"=",C0$(J*12+1,(J+1)*12),
660 IF I=4 THEN I=0 ELSE 670\!
670 NEXTJ\!\RETURN
680 CHAIN "FILE"
690 END
```

Generalized Menu Program
Continued from page 98

PROGRAM LISTING

```
0001 : MENU.PGM
0002 :
0003 : Gene Embry  5/31/80
0004 :
0005 : Ver. 5469
0006 :
0007 : Generalized Menu Program
0009 :
0010 GOSUB 9800::Psm. Variables
0099 :
0100 : Display Menu
0101 :
0110 HOME :N=0
0112 LET A=-9::Adjust A to any value to make you happy
0114 PRINT TAB(W-LEN(N$)/2+A);N$::Center the Title
0120 FOR X=1 TO T
0140 LET X$=STR$(X)+". "+N$(X)
0142 IF IMOD(N,2)=0 THEN N=0:PRINT::Two columns per line
0150 PRINT TAB(W*N);X$;
0160 LET N=N+1
0180 NEXT X
0199 :
0200 : Do it
0201 :
0210 SKIP 2
0220 INPUT "MAKE SELECTION  ",S
0230 IF S<1 THEN 100
0240 IF S>T-1 THEN 900::End
0280 GOSUB N(S)::Go do somethins
0290 GOTO 100
0299 :
0900 : Done
0901 :
0910 PRINT
0920 PRINT "Bye!"
0990 END
0999 :
1000 : Task #1
1001 :
1010 GOSUB 8000
1090 RETURN
1099 :
1400 : Task #2
1401 :
1410 GOSUB 8000
1490 RETURN
1499 :
1800 : Task #3
1801 :
1810 GOSUB 8000
1890 RETURN
1899 :
2000 : Task #4
2001 :
2010 GOSUB 8000
2090 RETURN
2099 :
2500 : Task #5
2501 :
2510 GOSUB 8000
2590 RETURN
2599 :
3000 : Task #6
3001 :
3010 GOSUB 8000
3090 RETURN
3099 :
4000 : Task #7
4001 :
4010 GOSUB 8000
4090 RETURN
4099 :
5000 : Task #8
5001 :
5010 GOSUB 8000
5090 RETURN
5099 :
6000 : Task #9
6010 GOSUB 8000
6090 RETURN
6099 :
8000 : Standard printout
8001 :
8010 PRINT
8030 PRINT "This is Task #";S;
8040 INPUT "Press <CR> to continue  ",Q$
8090 RETURN
8099 :
9800 : Psm Variables
9801 :
9810 LET W=35::Tab value for 2nd column
9812 LINE= 0
9820 READ N$,P$
9822 IF N$="END" THEN 9830
9824 LET T=T+1::The # of major routines in this program
```

```
9826 GOTO 9820
9830 DIM N$(T),N(T)
9832 RESTORE
9834 FOR X=1 TO T
9836 READ N$(X),N(X)
9838 NEXT X
9888 LET N$="Generalized Menu Program"::Title of this program
9890 RETURN
9899 :
9900 : DATA
9901 :
9910 DATA Task #1,1000
9912 DATA Task #2,1400
9914 DATA Task #3,1800
9916 DATA Task #4,2000
9918 DATA Task #5,2500
9920 DATA Task #6,3000
9922 DATA Task #7,4000
9924 DATA Task #8,5000
9926 DATA Task #9,6000
9940 DATA Terminate,0
9948 DATA END,0
9999 :
```

Sample printout of generalized menu program.

```
1. Task #1          2. Task #2
3. Task #3          4. Task #4
5. Task #5          6. Task #6
7. Task #7          8. Task #8
9. Task #9          10. Terminate

MAKE SELECTION  ? 7

This is Task #7 press <CR> to continue  ?

                Generalized Menu Program

1. Task #1          2. Task #2
3. Task #3          4. Task #4
5. Task #5          6. Task #6
7. Task #7          8. Task #8
9. Task #9          10. Terminate

MAKE SELECTION  ? 15

Bye!

BASIC
#
```

1980 Index to INTERFACE AGE™

compiled by Jim Schreier

An index so far-reaching as to reference the diverse subjects in a year of INTERFACE AGE issues has a lot of territory to cover. Since the purpose of this index is to catalog as much information as possible within a limited space, it is subject-oriented. An effort was made to list the topics covered in regular monthly columns as well as articles.

The index is presented in 11 divisions. Cross-indexing was used when applicable. The software applications section not only identifies the program, but type of source used (Basic, assembled, etc.)

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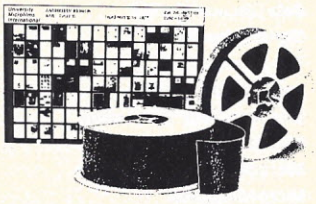

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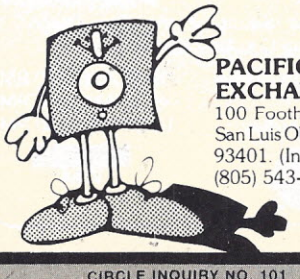

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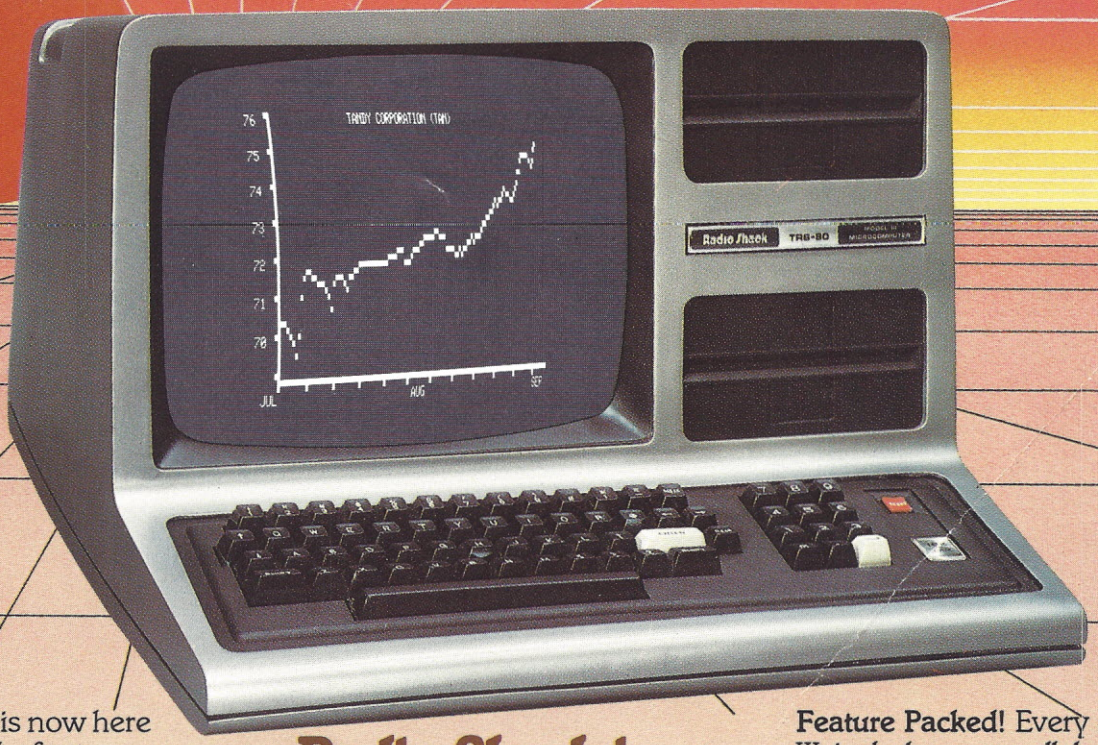

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